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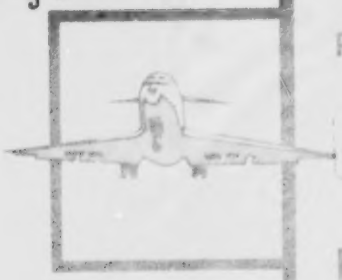

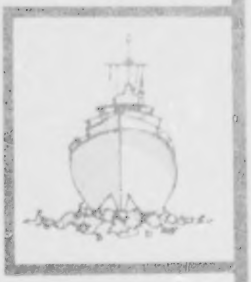

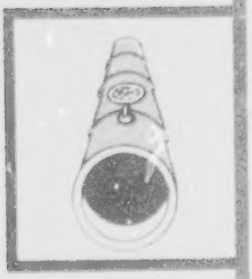

NATIONAL TRANSPORTATION SAFETY BOARD

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

SAFETY STUDY

ORIGINAL

RAILROAD/HIGHWAY GRADE CROSSING REVIEW -- CALENDAR YEARS 1983 AND 1984

NTSB/SS-85/05

UNITED STATES GOVERNMENT

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16. Abstract The National Transportation Safety Board has had a longstanding objective to improve safety at railroad/highway grade crossings. From 1976 to 1984, the Safety Board investigated 161 railroad/highway grade crossing accidents. These accidents resulted in 168 fatalities, 457 injuries, and estimated property damage in excess of $43.2 million. As a result of these investigations, the Board has issued 151 Safety Recommendations to Federal and State agencies, railroads, and safety-related organizations, urging both general and site-specific grade crossing safety improvements. Accidents at grade crossings continue to produce the largest single group of fatalities and injuries that result from railroad operations. Railroad data reported to the Federal Railroad Administration (FRA) for calendar years 1979 through 1983 indicate that progress has been made by Federal, State, and local agencies, by railroads, and by public and private safety organizations in reducing (by approximately 30 percent) the loss of life and injuries from these accidents. However, preliminary 1984 data provided to the Safety Board by the FRA indicate that the downward trend in fatalities, injuries, and accidents may be reversing. In 1983, there were 6,562 reported accidents, 542 fatalities, and 2,467 injuries. In 1984, there were an estimated 7,281 reported accidents, 649 fatalities, and 2,910 injuries. Thus, accidents increased 10.9 percent, fatalities increased 19.7 percent, and injuries increased 17.9 percent from 1983 to 1984.

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This report was prepared to summarize the Safety Board grade crossing accident investigations undertaken during calendar years 1983 and 1984 and to highlight some of the major safety issues in which the Board believes some safety accomplishment can be realized. Reports on 4 of the 18 accidents have been published under separate cover. The other 14 accident investigations are included for the first time in this report. The Safety Board believes this type of review and documentation of one type of accident will be useful to persons interested in this particular railroad/highway safety problem.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

SAFETY STUDY

Adopted: September 30, 1985

RAILROAD/HIGHWAY GRADE CROSSING REVIEW CALENDAR YEARS 1983 AND 1984

INTRODUCTION

The National Transportation Safety Board has had a longstanding objective to improve safety at railroad/highway grade crossings. Accidents at grade crossings continue to produce the largest single group of fatalities and injuries that result from railroad operations. Railroad data reported to the Federal Railroad Administration (FRA) for calendar years 1979 through 1983 (see table 1) indicate that progress has been made by Federal, State, and local agencies, by railroads, and by public and private safety organizations in reducing (by approximately 30 percent) the loss of life and injuries from these accidents.

Table 1.--Railroad/highway grade crossing accidents. 1/

Year	Accidents	Fatalities	Injuries
1979	11,552	834	4,172
1980	9,763	788	3,662
1981	8,546	697	3,121
1982	7,158	580	2,508
1983	6,562	542	2,467

However, preliminary 1984 data provided to the Safety Board by the FRA indicate that the downward trend in fatalities, injuries, and accidents may be reversing. In 1983, there were 6,562 reported accidents, 542 fatalities, and 2,467 injuries. In 1984, there were an estimated 7,281 reported accidents, 649 fatalities, and 2,910 injuries. Thus, accidents increased 10.9 percent, fatalities increased 19.7 percent, and injuries increased 17.9 percent from 1983 to 1984.

The Safety Board investigates only a small number of these accidents. From 1976 to 1984, the Safety Board investigated 161 railroad/highway accidents. These accidents resulted in 168 fatalities, 457 injuries, and estimated property damage in excess of $43.2 million. As a result of these investigations, the Board has issued 151 Safety Recommendations to Federal and State agencies, railroads, and safety-related organizations, urging both general and site-specific grade crossing safety improvements.

This report was prepared to summarize the Safety Board grade crossing accident investigations undertaken during calendar years 1983 and 1984 and to highlight some of

1/ Source: Federal Railroad Administration, Rail-Highway Crossing Accident/Incident and Inventory Bulletin, No. 6, Calendar Year 1983.

the major safety issues in which the Board believes some safety accomplishment can be realized. Reports on 4 of the 18 accidents have been published under separate cover. 2/ The other 14 accident investigations are included for the first time in this report. The Safety Board believes this type of review and documentation of one type of accident will be useful to persons interested in this particular railroad/highway safety problem.

INVESTIGATION HIGHLIGHTS, 1983-1984

During calendar years 1983 and 1984, the Safety Board investigated 18 railroad/highway grade crossing accidents. Seven of these accidents involved the collision of National Railroad Passenger Corporation (Amtrak) passenger trains with motor vehicles, and resulted in 7 fatalities and 172 injuries. The other 11 accidents involved collisions with freight trains and motor vehicles, and resulted in 18 deaths and 98 injuries. (See appendix A.)

The Safety Board's investigations and analyses of these accidents identified the following grade crossing safety issues:

- Routing--The routing of motor vehicles, particularly schoolbuses and trucks carrying hazardous materials, over grade crossings that do not have active warning devices (flashing lights, gates, and/or bells) is a major safety problem at grade crossings. A number of recent accidents involving the routing of heavy trucks, trucks carrying hazardous materials, and schoolbuses over crossings with only passive warning signs have led to fatal accidents.

- Driver Behavior--Motor vehicle drivers often disregard warning devices, are inattentive, or take other improper actions that lead to their driving across crossings in front of trains; drivers may be influenced by their lack of understanding of train characteristics or may be inattentive to safety warnings.

- Booby-trap Crossings--At booby-trap crossings, which usually have passive warning devices, a reasonable and prudent motor vehicle driver has difficulty crossing safely because an obstruction limits the driver's sight distance and visibility of the train.

- Audible Warning Systems--To avoid a collision at a booby-trap crossing, the motor vehicle driver must perceive the approach of the train audibly if visual recognition is not possible; the role of the train's audible warning system becomes particularly important in the case of high-speed trains.

2/ Railroad/Highway Accident Reports--"Collision of Amtrak Passenger Train No. 301 on Illinois Central Gulf Railroad with Marquette Motor Service Terminals, Inc. Delivery Truck, Wilmington, Illinois, July 28, 1983" (NTSB/RHR-84/02); "Collision of Amtrak Train No. 88 with Tractor Lowboy Semitrailer Combination Truck, Rowland, North Carolina, August 25, 1983" (NTSB/RHR-84/01); "Grade Crossing Collision of Florida East Coast Railway Company Freight Train and Indian River Academy Schoolbus, Port St. Lucie, Florida, September 27, 1984" (NTSB/RHR-85/01); "Collision of Isle of Wight County, Virginia Schoolbus with Chesapeake and Ohio Railway Company Freight Train, State Route 615, near Carrsville, Virginia, April 12, 1984" (NTSB/HAR-85/02).

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- Vehicle Ground Clearance--Motor carriers transporting heavy equipment on trucks that do not have sufficient ground clearance to clear elevated surface profiles at crossings have become lodged on tracks and struck by trains.

Routing

The Safety Board has investigated numerous accidents involving schoolbuses, hazardous materials trucks, and heavy trucks. Often these accidents occur at grade crossings equipped only with passive devices. The Safety Board is concerned about the routing of these types of vehicles over grade crossings that do not have active warning devices.

In the McBee, South Carolina, accident, the truck was rerouted by the State highway department to a crossing that was not safe for the type of vehicle. The crossing did not have active warning devices, the train's audibility warning system could not be heard, and there were obstructions that resulted in poor driver sight distance. Such crossing conditions should be considered by State or local governments or railroad officials before they reroute highway traffic.

In 1983 and 1984, the Safety Board investigated three schoolbus accidents at grade crossings. Two of these accidents--in Jacksonville, North Carolina, and in Carrsville, Virginia--occurred at passive grade crossings and resulted in 1 fatality and 58 injuries.

The routing of schoolbuses to avoid grade crossings without active warning devices is difficult because many schoolbuses operate in rural areas where most crossings do not have active warning devices. However, the Safety Board believes that school districts should plan schoolbus routing to avoid such crossings as much as possible, and should ensure that detailed information is available to schoolbus operators explaining the hazards of railroad/highway grade crossings, discussing driver responsibilities, and suggesting alternate routing if available. Furthermore, where rerouting is not feasible, the consequences of unavoidable accidents can be made less severe if school districts improve policies and procedures for emergency evacuation in the event a schoolbus stalls on a grade crossing. For example, two students died in a grade crossing collision between a freight train and a schoolbus stalled on the tracks at Port St. Lucie, Florida, on September 27, 1984. The driver was injured seriously. She had received no training in evacuation procedures; furthermore, the rear emergency door was not available for evacuation because it was locked by a supplemental deadbolt lock which could not be opened easily.

As a result of the Carrsville, Virginia, accident, the Safety Board issued Safety Recommendation H-85-4 on March 22, 1985, to the State Directors of Public Transportation of the 50 States and the District of Columbia:

> Encourage local school jurisdictions to establish and enforce procedures to systematically monitor schoolbus driver compliance with railroad crossing stop requirements and routing requirements which include on-scene observations of driver performance.

Driver Behavior

In 44 percent (8 of 18) of the accidents investigated by the Safety Board in calendar years 1983 and 1984, the motor vehicle drivers disregarded warning devices, were

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Table 2.--Accidents attributed to improper driver actions.

Date	Location	Vehicle	Fatalities	Injuries
1/14/83	Jacksonville, North Carolina	Schoolbus	0	32
7/20/83	Edmond, Kansas	Hazardous materials truck	2	0
7/28/83	Wilmington, Illinois	Truck	0	21
10/31/83	Jacksonville, Florida	Van	1	1
4/12/84	Carrsville, Virginia	Schoolbus	1	26
4/20/84	Haskell Heights, Indiana	Hazardous materials truck	3	7
4/23/84	Lacon, Illinois	Truck	1	0
5/4/84	El Monte, California	Automobile	4	0

inattentive, or took another improper action which led to their driving across the crossing in front of trains. 3/ (See table 2.) Seven of the eight accidents occurred at locations with passive railroad crossing signs (crossbucks). Illustrative of the Safety Board's concerns about improper motor vehicle driver actions are the following accidents:

On July 20, 1983, a freight train was struck by a tractor-trailer semicombination truck transporting 10,400 gallons of anhydrous ammonia at a grade crossing near Edmond, Kansas. The anhydrous ammonia escaped, and the two occupants of the truck died from acute ammonia exposure. The highway crossed the railroad track at a 90-degree angle, and the approach to the crossing was marked clearly with a railroad advance warning sign, a lane pavement railroad warning sign, and a crossbuck sign. The weather was clear with daylight conditions. The truckdriver disregarded the passive warning signs and did not comply with a Federal regulation and a State law which required stopping at grade crossings.

On May 4, 1984, an Amtrak passenger train was struck by a motor vehicle at a grade crossing in El Monte, California. The approach to the crossing was marked with an advance warning sign, a lane pavement railroad warning sign, and a crossbuck sign. Each

3/ The Safety Board investigates selected grade crossing accidents which involve fatalities, injuries, or a high amount of property damage. These samples of accidents are not necessarily representative of all crossing accidents but are sufficient to identify safety issues.

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side of the roadway had flashing signal lights and double gate arms. The weather was clear. The motor vehicle driver failed to stop at the grade crossing. The driver and three passengers in the motor vehicle were killed.

One of the reasons that motor vehicle drivers may disregard warning signs and devices and take the risk of crossing in front of an approaching train is their lack of understanding that, under most circumstances, trains are unable to stop short of the crossing. The Safety Board believes that "Operation Lifesaver" will minimize these type of accidents by educating drivers to the hazards at railroad/highway grade crossings and by increasing enforcement at these locations. The Board has been successful in helping to bring about the expansion of the national "Operation Lifesaver" program. As a result of its investigation of a railroad/highway grade crossing accident in Des Moines, Iowa, in 1976, 4/ the Board issued Safety Recommendations H-77-25 through -31 on November 3, 1977, to several Federal agencies and national and international associations on the need for a nationally unified "Operation Lifesaver" program. (See appendix B.) "Operation Lifesaver" can target programs to educate all drivers on a continuous basis, particularly schoolbus drivers and hazardous materials truckdrivers, about the hazards of grade crossings and the need for increased safety awareness at these locations. The Board's recommendations accelerated the development and implementation of "Operation Lifesaver" under the auspices of the National Safety Council. This program coordinates efforts of the States for the development and implementation of programs to improve grade crossing safety through education, enforcement, and engineering. Prior to the issuance of these recommendations, "Operation Lifesaver" had been adopted in only 11 States; by the end of calendar year 1984, 44 States had adopted the program. Three States--Nevada, Wisconsin, and Wyoming--kicked off their programs in May 1985. Delaware, Pennsylvania, and the District of Columbia do not have Operation Lifesaver programs. Hawaii has no public grade crossings. (See appendix C.)

Booby-trap Crossings

Booby-trap crossings are those over which a reasonable and prudent motor vehicle driver has difficulty negotiating safely. Often the booby-trap is an obstruction which limits the driver's ability to see a train in time to react safely; this is a problem primarily at grade crossings with passive warning signs.

On March 30, 1984, a westbound freight train struck a heavy truck at a grade crossing in Malakoff, Texas, killing the truckdriver. One of the train's piggyback flatcars containing a trailer of chromic acid, which is corrosive and toxic, became involved in a fire. As a result, 300 persons in the area had to be evacuated. The Safety Board's investigation revealed that the train was not fully visible to the northbound truckdriver until he was within 70 feet of the crossing--a distance insufficient to permit the driver to stop his truck. The crossing did not have any active signal warning devices. Warning of the crossing consisted of an advance railroad warning sign and crossbuck.

On July 2, 1984, a deputy sheriff's patrol car was struck by a road switcher at a grade crossing near Williams, California. The deputy sheriff was killed. The investigation revealed that a motor vehicle operator driving west (as the deputy was) must be within

4/ Railroad/Highway Accident Report--"Collision of a Chicago, Rock Island and Pacific Railroad Company Freight Train with an Automobile, Des Moines, Iowa, July 1, 1976" (NTSB-RHR-77-2).

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125 to 130 feet of the crossing to see a southbound train. This is not an adequate sight distance for reacting and stopping a car. The crossing had passive warning signs; there were no active signal warning devices.

On July 11, 1984, an Amtrak passenger train struck a hazardous materials truck carrying 8,000 gallons of gasoline at a grade crossing in McBee, South Carolina. The locomotive and truck were engulfed in fire upon impact. The train was carrying 16 crewmembers and 309 passengers. The engineer of the train and the truckdriver were killed, and the train's fireman received serious injuries. Four passengers required medical attention. Both visibility and audibility of the train were considered safety issues in this accident. The Safety Board's investigation revealed that the crossing had a passive warning sign and stop sign and was being used as a temporary detour route for highway vehicles while work was performed on an adjacent crossing that had active warning devices. Railcars were stored on siding tracks on both sides of the crossing. The truckdriver pulled the truck onto the track, apparently to see if a train was coming. Because of these railcars and the noise level inside the truck, the truckdriver could not see or hear the train without pulling close to the track. Moreover, the train's speed was not required to be reduced over this section of track at the time of the accident; it is a general railroad practice to require reduced train speed through areas where certain types of crossing work is in progress.

Booby-trap crossings with sight distance limited by obstructions such as those exhibited in these three accidents exist throughout the United States. The Safety Board believes that action is necessary by Federal, State, and local government to remove obstructions, improve the warning features of crossings, or reduce train speeds at such dangerous crossings to compensate for the booby-trap or, in the event of a collision, minimize impact speed.

Audible Warning Systems

Three accidents, including the McBee, South Carolina, accident previously discussed, raise concern about the ability of truckdrivers to hear a warning of trains traveling at high speeds. On March 15, 1984, a southbound tractor-semitrailer truck, loaded with about 24 cubic yards of rock, was struck by a westbound Amtrak passenger train at the railroad/highway grade crossing near Bainville, Montana. The train was derailed and some rail cars were separated. The truck was destroyed, and the driver was killed. Forty-four passengers on the train were injured, and property damage was estimated at $1.56 million.

On May 17, 1984, a northbound tractor/cargo-tank semitrailer, loaded with about 8,200 gallons of liquefied anhydrous ammonia, was struck by an eastbound freight train at a railroad/highway grade crossing near Avondale, Colorado. The collision of the truck and the train caused the release of anhydrous ammonia. The fireman and engineer of the train died. Twenty-seven persons, including emergency response personnel and bystanders inadvertently caught in the ammonia release, received injuries, mostly from inhalation of ammonia.

In all three of these daytime accidents, the crossings had passive warning signs (crossbucks) but no active equipment such as gates, flashing lights, or bells. Motor vehicle operators must perceive the approach of a train visually or aurally to avoid impact. In all of these accidents, the trains were approaching the grade crossings at high speed. In the Bainville and Avondale accidents, and probably in the McBee accident, the truck radios and citizens band radios were found in the "ON" position. The Safety Board believes that

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it is difficult for many truckdrivers to hear a train's audible warning system in a noisy truck cab and that this difficulty can contribute to accidents. More testing, research, and further accident data collection are needed to improve the audibility of trains at railroad/highway grade crossings.

Vehicle Ground Clearance

Two accidents involved motor carriers transporting heavy equipment on trucks that did not have sufficient ground clearance to clear the elevated surface profile at a crossing. On August 25, 1983, an Amtrak passenger train struck a tractor-lowboy semitrailer combination truck that had become lodged on a grade crossing in Rowland, North Carolina. Two locomotive units and two cars derailed; 29 persons were injured. The truck was damaged substantially and its cargo was destroyed; property damage was estimated at $623,000. 5/

A similar accident occurred at Citra, Florida, on November 11, 1983. An Amtrak passenger train struck a truck lodged on a grade crossing, resulting in minor injuries to 47 passengers and 11 crewmembers. The truck and its cargo was damaged. Property damage was estimated at $229,000.

As the result of the first two accidents, the State of Florida has taken action to address this safety concern. In January 1984, a Florida committee was formed to study the problem of hazardous grade crossing profile conditions. This committee developed an action program which is currently being implemented. Some of the major features of this program are:

- Development of a standard roadway (profile) design for grade crossings;
- Identification of crossings currently not in compliance with the standard;
- Development and implementation of a program to install warning signs at crossings identified as having hazardous surface hump profiles.

In its report of the Rowland accident, the Safety Board concluded that motor carriers who transport heavy equipment, new cars, or mobile homes on vehicles with low ground clearance need to be alerted to the dangers of railroad/highway grade crossings with surface profiles that will not allow them to clear a crossing successfully. The Board also concluded that railroads and local or State highway officials should coordinate with each other when a grade crossing profile is changed, to ensure that roadway approaches to the crossing are adequate for motor vehicle traffic.

On August 9, 1984, based on the findings of the Rowland accident, the Safety Board issued Safety Recommendation H-84-65 to the Federal Highway Administration (FHWA):

> Issue an On-Guard Bulletin alerting motor carriers of the hazards of railroad/highway grade crossings with high surface hump profiles.

The Board received an acknowledgement of the recommendation from the FHWA on September 13, 1984; no further action in response to the Board's recommendation has been received.

5/ Railroad/Highway Accident Report--"Collision of Amtrak Train No. 88 with Tractor Lowboy Semitrailer Combination Truck, Rowland, North Carolina, August 25, 1983" (NTSB/RHR-84/01).

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Also as a result of the Rowland accident, the Safety Board issued Safety Recommendation R-84-69 to the American Association of State Highway and Transportation Officials (AASHTO):

> Review the State safety program dealing with hazardous grade crossing profile conditions now underway in Florida, and promote the adoption within each State of this program or a comparable program developed by an appropriate AASHTO committee.

AASHTO replied on August 30, 1984, that it had forwarded the recommendation to two of its committees, the State Committee on Highways and the Standing Committee on Highway Traffic Safety, for review and consideration.

The Board also issued the following Safety Recommendations to the Association of American Railroads (AAR):

> R-84-35
>
> Establish the specifications stated in Section 1.2, "Profile and Alignment of Crossings and Approaches," of the "Manual for Railway Engineering" of the American Railway Engineering Association as the minimum acceptable specifications for railroad/highway grade crossings.
>
> R-84-36
>
> Encourage all member railroads to coordinate activity related to track maintenance with local and State governments to preserve the integrity of the profiles at railroad/highway grade crossings.

In its response to the Board on September 19, 1984, the AAR fully supported Safety Recommendation R-84-36 and said it encouraged its membership to coordinate with local and State governments on the profiles at grade crossings. In response to Safety Recommendation R-84-35, the AAR indicated that it has no role in the development of minimum specifications for grade crossings, because this is more correctly a public highway program (Federal and State).

The Safety Board encourages the FHWA, the AASHTO, and the AAR to continue efforts to eliminate the problem of hazardous surface hump profiles at grade crossings and to monitor the progress of the Florida crossing profile program.

SUMMARY

The accidents discussed in this review illustrate five important railroad/highway grade crossing safety issues: (1) routing; (2) motor vehicle driver behavior; (3) booby-trap crossings; (4) ineffectiveness of audible warnings; and (5) insufficient vehicle ground clearance on crossings with elevated surface profiles.

The Safety Board will continue to examine these safety issues in future grade crossing accident investigations and will issue Safety Recommendations, where appropriate, to public and private organizations that can act to reduce railroad/highway grade crossing accidents. The Safety Board will provide further information on these grade crossing safety issues and potential directions that railroad/highway grade crossing safety initiatives should take from these grade crossing accident investigations and studies.

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BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G. H. PATRICK BURSLEY
Member

September 30, 1985

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APPENDIX A

NATIONAL TRANSPORTATION SAFETY BOARD GRADE CROSSING ACCIDENT INVESTIGATONS (CALENDAR YEARS 1983 AND 1984)

Passenger Train Grade Crossing Accidents

	Location	Date	Fatalities	Injuries
1.	Wilmington, IL 1/	7/28/83	0	21
2.	Rowland, NC 1/	8/25/83	0	29
3.	Citra, FL	11/30/83	0	58
4.	Plant City, FL	1/24/84	0	7
5.	Bainville, MT	3/15/84	1	52
6.	El Monte, CA	5/4/84	4	0
7.	McBee, SC	7/11/84	2	5
	Totals:		7	172

Freight Train Grade Crossing Accidents

8.	Jacksonville, NC	1/14/83	0	32
9.	Edmond, KS	7/20/83	2	0
10.	Jacksonville, FL	10/31/83	1	1
11.	Shelly, ID	1/27/84	4	7
12.	Malakoff, TX	3/30/84	1	0
13.	Carrsville, VA 1/	4/12/84	1	26
14.	Haskell Heights, IN	4/20/84	3	7
15.	Lacon, IL	4/23/84	1	0
16.	Avondale, CO	5/17/84	2	24
17.	Williams, CA	7/2/84	1	0
18.	Port St. Lucie, FL 1/	9/27/84	2	1
	Totals:		18	98

1/ The Safety Board has issued separate reports on these accidents. The four published Safety Board reports available are: Railroad/Highway Accident Reports--"Collision of Amtrak Passenger Train No. 301 on Illinois Central Gulf Railroad with Marquette Motor Service Terminals, Inc., Delivery Truck, Wilmington, Illinois, July 28, 1983" (NTSB/RHR-84/02); "Collision of Amtrak Train No. 88 with Tractor Lowboy Semitrailer Combination Truck, Rowland, North Carolina, August 25, 1983" (NTSB/RHR-84/01); "Grade Crossing Collision of Florida East Coast Railway Company Freight Train and Indian River Academy Schoolbus, Port St. Lucie, Florida, September 27, 1984" (NTSB/RHR-85/01); "Collision of Isle of Wight County, Virginia Schoolbus with Chesapeake and Ohio Railway Company Freight Train, State Route 615, near Carrsville, Virginia, April 12, 1984" (NTSB/HAR-85/02).

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1. Location: Wilmington, Illinois
Date: 7/28/83

About 8:50 a.m., on July 28, 1983, southbound Amtrak passenger train No. 301, the State House, consisting of one locomotive unit, two coaches, and a combination coach and food service car, departed Chicago, Illinois, for St. Louis, Missouri, on the main track of the Joliet District to the Illinois Central Gulf Railroad (ICG). Inspections and brake tests performed at Chicago indicated no defects, and the train departed on schedule.

According to the engineer and fireman, the accuracy of the speed indicator was checked over the course of 1 mile after the train left Chicago. The fireman, who was operating the locomotive, stated that the mile was covered in 43 seconds and that during the speed check the indicator needle at times rested at 80 mph, at other times was as low as 76 mph, and at other times was as high as 82 mph. The engineer recalled that the indicated speed was 2 mph less than the actual speed of 83.72 mph as calculated on the basis of elapsed time between the milepost (MP) markers. The maximum allowable operating speed of the train was 79 mph.

The train left Joliet, Illinois (MP 37.2), the only station stop between Chicago and Wilmington, Illinois, about 3 minutes behind schedule. The fireman was operating the locomotive unit from the right (west) side of the cab. The engineer was seated on the left side opposite the fireman. The lead car, a coach, was unoccupied. Of the 102 passengers on the train, about 85 were in the second car; the others were in the rear cars. The conductor and flagman also were seated in the second car. An Amtrak car service attendant was in the rear car.

The train traveled over a long, level tangent section of track for 5 miles between Elwood, Illinois (MP 45.8), and Wilmington. According to the fireman, as the train approached the railroad/highway grade crossing at New River Road (MP 51.4) north of Wilmington, he began sounding the standard crossing whistle signal before the train reached the whistle post 1,660 feet before the crossing. The activation of the whistle would have caused the locomotive unit's headlight to brighten automatically and its strobe light to operate. The locomotive was in the power mode with the throttle in the third or fourth position, or about midway between the idle and full throttle positions. Both the engineer and fireman said that the train's speed approaching the crossing was about 70 to 75 mph.

A two-axle cargo van truck, operated by Marquette Motor Service Terminals, Inc., was moving east on New River Road en route to deliver merchandise to a factory about 1 mile east of the crossing. The driver was alone in the truck. The engineer and fireman of the train stated that the truck closely followed an automobile onto the crossing and appeared to be traveling about 40 to 50 mph. The fireman applied the train's brakes in emergency when he realized that the truck was not going to stop and that a collision was imminent. The locomotive unit struck the van cargo area of the truck behind the cab, separating it from the chassis. One side of the van cargo area became wrapped around the windshield of the locomotive. The truck's chassis and cab also were separated, both coming to rest in a ditch in the southeast quadrant of the crossing. Other parts of the truck and its lading were scattered east of the crossing.

As a result of the collision, the locomotive unit derailed, and upon exiting the crossing its lead truck turned over and displaced the east rail from the track structure. The displaced rail caused the train's cars to derail as they passed over the crossing.

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The couplers between cars did not separate. The locomotive unit remained upright on the track structure and came to a stop about 800 feet south of the crossing. The lead car remained in line with the locomotive unit but was tilted about 45 degrees to the left (east). The second car came to a stop diagonally to the track with its left side against the east embankment. The rear car was diverted laterally from the track structure down an embankment into a deep ditch east of the track grade, where it came to a stop on its left side.

The truckdriver told investigating police officers immediately after the accident that he did not see or hear the train and that he did not see the crossbuck warning signs and flashing light signals as the truck approached the crossing. Other than the truckdriver and the train's engineer and fireman, there were no known witnesses to the accident. The driver of the automobile that preceded the truck onto the tracks did not stop. A motorist on a highway parallel to the railroad about 1/2 mile to the east saw a cloud of dust at the crossing and drove there to investigate. He reported the accident to the Wilmington police dispatcher over the citizens band radio in his car.

The National Transportation Safety Board determined that the probable cause of the accident was the failure of the truckdriver for undetermined reasons to perceive the crossbuck warning signs, the flashing light signals, the approaching train, or the whistle of the approaching train and to stop his vehicle short of the tracks at the railroad/highway grade crossing.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Illinois Central Gulf R.R. Brief of Railroad No.: DCA-83-A-R008

Location:	Time:	Date:	Weather:	Visibility:
Wilmington, Illinois	0948 c.d.t.	07-28-83	Clear/Dry	5,000 ft.

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Amtrak No. 301	Passenger	South	En route	001
2					
3					

Accident Description: Train 1 struck truck at grade crossing. Locomotive and three cars derailed. Truck was destroyed. Speed of train was 82 mph. Engineer aware of impending accident.

Probable Cause:

1. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the truckdriver for undetermined reasons to perceive the crossbuck warning signs, the flashing light signals, the approaching train, or the whistle of the approaching train and to stop his vehicle short of the tracks at the railroad/highway grade crossing.

Other Factors:

1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
0		1	Truckdriver
		2	Traincrew
		18	Passenger

Probable Cause of Casualty:

1. Train struck truck
2.
3.

Property Losses:
Railroad: $560,000
Non-Railroad: 24,000

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2. Location: Rowland, North Carolina
Date: 8/25/83

Northbound Amtrak train No. 88, the Silver Meteor, operating on Seaboard System Railroad (Seaboard) track, departed St. Petersburg, Florida, at 9:44 a.m., on August 24, 1983, for New York, New York. 1/ At Jacksonville, Florida, the equipment of Amtrak passenger train No. 98 from Miami, Florida, was added to train No. 88's consist. Train No. 88 left Jacksonville at 5:07 p.m. with 2 General Motors F40PH diesel-electric locomotive units, 4 baggage cars, and 14 passenger cars. About 7:40 p.m., the train struck and killed a pedestrian about 8 miles north of Savannah, Georgia. The train left O'Leary, Georgia, at 8:57 p.m. About 9:27 p.m., the train struck a pickup truck that was stopped too close to the track near Ridgeland, South Carolina. The train was inspected, but no damage was found, except that the speedometer on the lead locomotive unit was rendered inoperative by the collision. The train departed Ridgeland at 9:55 p.m. and arrived at Florence, South Carolina, about 12:24 a.m. on August 25. The train and engine car crews were changed, and the train left Florence at 12:30 a.m., 1 hour 38 minutes behind schedule. The train consist was unchanged. Aboard the train were an engineer, a fireman, a conductor, and 2 brakemen employed by Seaboard, 22 train attendants employed by Amtrak, and 363 passengers.

At MP 256.4, 36 miles north of Florence, the engineer slowed the train's speed to about 30 mph to comply with a slow order between MP locations 256.4 and 254.7. As the train approached Rowland, North Carolina, the train's speed had been increased to about 65 mph according to the engineer. When the train was about 1,200 feet south of the Church Street railroad/highway grade crossing in Rowland, the engineer saw the semitrailer of a truck blocking the crossing. He applied the train's brakes in emergency, and he and the fireman lay on the floor of the locomotive cab. The lead locomotive unit struck the semitrailer, derailed to the right, separated from the second unit, turned over on its right side, and slid along the ground. The second locomotive unit continued forward on its wheels and struck the overturning lead locomotive unit. The force of the collision caused the lead locomotive unit to return to an upright position. The lead locomotive unit was turned about 130 degrees, with its front end resting in a drainage ditch; its rear end lay close to the following end of the second locomotive. The second locomotive unit, the following baggage mail car, and the baggage dormitory car were derailed upright. They remained parallel and to the left of the track. The other 16 cars were not derailed. There was no fire.

The truck involved in the accident, an S. L. Balogh Trucking Company, Inc., tractor-lowboy semitrailer combination unit transporting a large piece of road construction equipment, had left Stanhope, New Jersey, about 1 p.m. on August 23, 1983, destined for Hialeah Garden, Florida. The truck traveled south on Interstate Route 95 (I-95), and the truckdriver stopped to rest in Virginia from 1 a.m. to 9 a.m. on August 24. According to the truckdriver, he continued on I-95 and stopped at a truckstop in St. Paul, North Carolina, between 8:30 p.m. and 9 p.m. The truck departed the truckstop at 12:01 a.m. on August 25 and traveled west on State Route 20. The truckdriver said that he did not return to I-95 because he wanted to find a route that would take him around a weigh (scale) station located farther south on I-95.

1/ Amtrak passenger trains operate over Seaboard System Railroad track from St. Petersburg and Miami, Florida, to Richmond, Virginia, and are manned by Seaboard train and engine crews and Amtrak car attendants.

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The truckdriver continued west on State Route 20 and then on other highways that led him to eastbound State Route 130, which was designated Main Street in Rowland. The truck traveled east on Main Street, and as the truckdriver approached the Main Street grade crossing of the Seaboard's main line, he found the crossing barricaded. Earlier in the day, Seaboard personnel had removed the pavement to resurface the crossing. The truckdriver turned right onto South Railroad Street, which parallels the west side of the railroad right-of-way, and headed south. The next grade crossing south of Main Street was at Church Street, where the truckdriver attempted to turn left and move across the railroad track. The truck tractor successfully crossed the track, but the bottom of the semitrailer struck and became lodged on the track. Efforts by the truckdriver to drive the semitrailer off the track failed. The driver attempted to raise the semitrailer frame by operating the rams on the semitrailer gooseneck, but the semitrailer remained lodged on the track. The truckdriver did not place flares on the track; he was not carrying any on his vehicle. About 5 to 10 minutes later, the truckdriver saw the headlight of the approaching train, and the warning devices at the crossing activated. He left the truck and ran from the crossing.

When the train struck the truck, the fifth wheel attachment to the truck-tractor frame separated, leaving the tractor relatively undamaged. The gooseneck separated from its attachment to the lowboy trailer bed and came to rest in the northeast quadrant of the crossing. The lowboy trailer came to rest upright after being rotated about 180 degrees from its original heading and into the northwest quadrant of the crossing. The piece of construction equipment broke loose from the lowboy trailer and came to rest north of the trailer.

The National Transportation Safety Board determined that the probable cause of this accident was the deliberate deviation of the truckdriver from the route prescribed on a permit for the movement of the oversized vehicle and an ensuing detour onto a railroad/highway grade crossing that would not accommodate the low ground clearance of the vehicle.

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Seaboard System Railroad

Brief of Railroad No.: NTC-83-F-R042

Location:	Time:	Date:	Weather:	Visibility:
Rowland, North Carolina	0110 e.d.t.	08-25-83	Clear/Dark	1,200 ft.

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Amtrak No 88	Passenger	North	En route	001
2					
3					

Accident Description: Train 1 struck tractor-lowboy semitrailer combination truck that was lodged on a grade crossing. The train derailed two locomotive units and two cars. Speed of train was 65 mph. Engineer was aware of impending accident.

Probable Cause: 1. The National Transportation Safety Board determines that the probable cause of this accident was the deliberate deviation of the truckdriver from the route prescribed on a permit for the movement of the oversized vehicle and ensuing detour onto a railroad/highway grade crossing that would not accomodate the low ground clearance of the vehicle.

Other Factors: 1.

2.

3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
0		6	Crewmembers
		23	Passengers

Probable Cause of Casualty:

1. Train Struck Truck
2.
3.

Property Losses:

Railroad: $264,000

Non-Railroad: 359,000

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3. Location: Citra, Florida
Date: 11/30/83

At 2:45 p.m., on November 30, 1983, a tractor/lowboy semitrailer combination unit (truck) was struck by a passenger train at a railroad/highway grade crossing in Citra, Florida. The lowboy trailer had become lodged on the crossing because of insufficient ground clearance. The locomotive and four cars of the eight-car train derailed. The truck and its cargo were substantially damaged. Forty-seven passengers and 11 Amtrak employees reported injury; 7 persons transported to a local medical center were treated and released. There was no fire. Estimated damage was $229,000.

Amtrak train No. 88, the Silver Meteor, was being operated by the Seaboard System Railroad under contractual agreement. The train had been operated without incident from Miami, Florida, to the point of the accident. The train was en route at a recorded speed of 79 mph as it rounded a 1-degree 50-minute curve about 4,000 feet south of the intersection of County Road 318 with the main track. The locomotive engineer and his fireman observed a man on the right-of-way waving his arms frantically and a truck on the railroad/highway grade crossing ahead of them. When he observed that the lowboy trailer was stuck on the crossing, the engineer stated that he immediately initiated a service application of the train's brakes and quickly followed that application with an emergency application of the train's brakes. The train's speed had been reduced to approximately 35 mph at impact. The lowboy trailer was loaded with a piece of earth-moving equipment and was equipped with a detachable gooseneck at its front. Upon impact, the gooseneck separated from the trailer but remained connected to the tractor's fifth wheel. The earthmover was dislodged from the trailer, and each component of the truck was shoved clear of the train following the initial impact. The west rail tipped outward immediately north of the highway pavement, and the locomotive and four cars derailed. They came to rest still coupled, upright, and generally in line. Neither the truckdriver nor his helper were in the vehicle at the time of the collision, and neither was injured.

County Road 318 is a bituminous-paved roadway that is 24 feet wide east of the railroad crossing and 27 feet wide west of that crossing. The roadway approaches to the rail crossing are tangent. A 3-percent average grade existed for 100 feet from the track's centerline on the east, and a 4-percent average grade existed for the same distance on the western approach. The angle of the intersection was approximately 89 degrees measured in the northeast quadrant. U.S. Highway 301 was about 1/8 mile west of this railroad/highway grade crossing. The crossing was installed with cantilevered red flashing lights, gate arms, and bells.

The cantilevered-type signal on which the crossing warning equipment was mounted in the northeast quadrant of the intersection and the mast supporting the crossing gates were struck by the deflected lowboy trailer. Approximately 450 feet of the west rail was turned over on its side toward the west and north of the intersection; most of this section of rail required replacement. Damage was estimated at $229,000.

The truckdriver had taken delivery of the lowboy trailer on the day preceding the accident. The trailer manufacturer provided the driver an orientation in the operation of the hydraulic feature that allowed lowering and raising the trailer's bed. He had not driven a tractor-semitrailer over the grade crossing before. He stated that he had observed the hump in the road at the grade crossing and slowed his truck to a crawl before

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to proceeding over the track. The driver believed that he was able to negotiate the hump over the track, but the truck became stuck after approximately 5 feet of the bed of the trailer had passed over the east rail about 2:30 p.m. Several attempts were made by the driver to use the hydraulic lift over the tractor's fifth wheel to lift the trailer off the hump by bouncing it. The hydraulic lift was in the maximum lift position when the trailer lodged on the crossing. The ground clearance of the trailer was approximately 9 1/2 inches when attached to the tractor and with the hydraulic ram fully extended.

The driver could hear the train's approach and sent his helper up the track to try to alert the engineer that the truck was lodged on the crossing. The truckdriver reentered the cab of the tractor and attempted to back the truck off the crossing. This attempt was also to no avail, and the driver leaped from the cab just seconds before impact.

During a postaccident meeting with the County Engineer of Marion County, Florida, it was ascertained that little, if any, contact had ever been made between the Seaboard management and the county highway officials. The county highway officials were aware that the railroad company had to raise the track level at highway intersections during maintenance procedures, but they were not sure whose responsibility it was to maintain the profile of the roadway approaches to the crossing. Since the Safety Board's involvement in the subject accident, the Marion County highway engineer has become aware of the need for the county's involvement in the maintenance of approaches to railroad crossings. Marion County is actively reviewing the roadway profile of each grade crossing within the county and assigning a priority for correction where conditions indicate one is necessary.

The Florida Department of Transportation also has taken preventive measures to avoid a recurrence of the type of accident that occurred in Citra. A copy of the State Uniform Traffic Control 316.170, moving heavy equipment at railroad grade crossing, wherein special precautions are contained concerning low or slow-moving vehicles crossing railroad grade crossings, is given to each applicant for a highway permit. Also, an employee of the Florida Department of Transportation who is on the National Committee on the Manual on Uniform Traffic Control Devices will request the committee to consider a sign for use at railroad/highway grade crossings where a roadway profile may present a hazard to vehicles having a low ground clearance.

Section 1.2, "Profile and Alignment of Crossings and Approaches," of the Manual for Railway Engineering published by the American Railway Engineering Association (AREA) states, "It is desirable that the surface of the highway be not more than 3 inches higher nor 6 inches lower than the top of nearest rail at a point 30 feet from the rail, measured at right angle thereto, unless track superelevation dictates otherwise." Similar guidelines could not be found in publications of the FHWA or the AASHTO.

The National Transportation Safety Board determined that the probable cause of this accident was that the truck lowboy trailer stuck on the grade crossing and the truckdriver made an error in judgment.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Seaboard System Railroad — Brief of Railroad No.: ATL-84-FR004

Location:	Time:	Date:	Weather:	Visibility:
Citra, Florida	1425 EST	11-30-83	Clear	Day/9,900 feet

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Amtrak	Passenger	North	En route	1
2					
3					

Accident Description:
Train 1 struck tractor trailer lowboy. Locomotive and four cars derailed. Lowboy trailer was hung up on grade crossing with working crossing lights and cross arms due to trailer low clearance. Speed of train 1 was 35 mph.

Probable Cause:
1. Truck lowboy trailer stuck on grade crossing
2. Truck driver made error in judgement
3.

Other Factors:
1. Florida Highway Permit Office gave incorrect truck routing on permit
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
0		0	
		(47 passengers - minor) (11 crew - minor)	

Probable Cause of Casualty:
1.
2.
3.

Property Losses:
Railroad: $159,000
Non-Railroad: 70,000

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4. Location: Plant City, Florida
Date: 1/24/84

At 1:38 p.m., on January 24, 1984, a southbound Amtrak passenger train operated by the Seaboard Railroad Company collided with a tractor-semitrailer truck at a railroad/highway grade crossing in Plant City, Florida. The trailer was loaded with seven concrete septic tanks. The locomotive's No. 2 pair of wheels derailed, and the train came to rest upright, in line and coupled. The tractor was separated from the trailer lodged on the front of the locomotive unit and was carried down the track before the train stopped. The engineer, four Amtrak employees, and two passengers reported injuries. All were taken to a local hospital and, with the exception of the engineer who was admitted, were treated and released. Damage was estimated to be approximately $74,000.

Train No. 87 was a scheduled first-class southbound passenger train that operated daily from Boston, Massachusetts, to St. Petersburg, Florida. The involved crew had entrained at Sanford, Florida, MP 766.3, and operated from Sanford to Plant City without incident. The train's airbrakes had been successfully used en route, with the most recent station stop made at Lakeland, Florida, MP 851.3. As the train approached the grade crossing at Park Road in Plant City, the engineer observed the crossing warning signals to be operating. He and the fireman also observed a truck stopped south of the track, near the rail but clear of the train's path. The train was about 500 feet from the intersection when the engineer observed the truck's wheels beginning to rotate in a forward direction. He immediately placed the automatic brake valve in the emergency position; the engineer and fireman then entered the locomotive unit's engineroom to avoid being in the cab at the time of impact. They had just entered the engineroom when the train collided with the truck.

The trailer separated from the tractor at impact and the septic tanks were destroyed. The train came to rest 378 feet south of the intersection with the heavily damaged trailer and its built-in overhead traveling crane/boom for handling the septic tanks wrapped around the front end of the locomotive unit. The leading truck of the locomotive unit had the No. 2 pair of wheels derailed.

Park Road is a two-lane, bituminous-paved highway approximately 20 feet wide with grass shoulders. The north-south highway crossed the single main track at an angle of about 80 degrees measured in the northeast quadrant. Both north and south approaches to the crossing were sloped to accommodate the approximately 2-foot rise in the roadway at the rail level. The crossing protection equipment at the crossing consisted of automatic red flashing lights and crossbucks mounted on masts in the southeast and northwest quadrants of the intersection. Standard railroad advance warning signs and pavement markings were in place at a reasonable distance from the crossing on the southern approach.

The truckdriver was employed by Driggers Concrete, Inc., of Ruskin, Florida, the owner/operator of the truck. He had been employed as a yard helper for some time, but had begun driving for the company about 1 week prior to the accident. He had left Ruskin, en route to make a delivery to Map Septic Tank Company in Orlando, Florida, on the day of the accident. He had driven this route with a truck one time previously. He held a valid driver license and had not been involved in any previous accidents.

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The truckdriver stated that as he approached the intersection of the Seaboard main track and Park Road, the traffic signal had changed to red and he had to make a hurried stop with the heavy truck. He knew the front end of the truck was near the track but could not back up because of vehicles closing up behind his stopped truck. The traffic signal changed to green, and he started to cross the track as the crossing warning lights began to operate. He observed the train approach but had committed himself to drive the truck across the track. The train struck the trailer in the area ahead of the right-rear wheels. The driver was thrown about inside the tractor cab. He was taken to a local hospital, treated, and released.

State of Florida Uniform Traffic Control law states the following:

316.1575 Obedience to signal indicating approach of train.

(1) Whenever any person driving a vehicle approaches a railroad grade crossing under any of the circumstances stated in this section, he shall stop within 50 feet but not less than 15 feet from the nearest rail of such railroad, and shall not proceed until he can do so safely. The foregoing requirements shall apply when:

(a) A clearly visible electric or mechanical signal device gives warning of the immediate approach of a railroad train;

(b) A crossing gate is lowered or a human flagman give or continues to give a signal of approach or passage of a railroad train;

(c) A railroad train approaching within approximately 1,500 feet of the highway crossing emits a signal audible from such distance, and the railroad train, by reason of its speed or nearness to the crossing, is an immediate hazard;

(d) An approaching railroad train is plainly visible and is in hazardous proximity to the crossing.

The truckdriver is the key factor in this accident. His admission to making a quick stop which put his truck tractor near the main track is apparently true. This was only his second trip as an over-the-road driver, which could account for this occurrence. His desire to back away from the track and inability to do so because of following vehicles is confirmed by the engineer's observations.

Since this accident, Plant City has improved the crossing warning equipment at the intersection of the Seaboard main track and Park Road by adding a motion-sensing device in the track circuit, gates, and flashing lights on a single mast.

The National Transportation Safety Board determined that the probable cause of this accident was (1) the truck was driven into the path of the train; (2) the truckdriver failed to vacate the truck's position on the tank; and (3) the truckdriver made an error in judgment.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Seaboard Systems Brief of Railroad No.: FTW84FR005

Location:	Time:	Date:	Weather:	Visibility:
Plant City, Florida	1338 EST	01/24/84	Clear	Day/9990 FT

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Amtrak	Passenger	South	En route	1
2					

Accident Description: Southbound Train No. 87 struck a tractor semitrailer combination unit at a rail/highway grade crossing at Park Road. The trailer was destroyed. The engineer was injured and hospitalized. The locomotive's No. 2 wheels were derailed. The engineer and fireman observed the truck stopped on the south side of the track near the rail. The engineer placed the automatic brake valve in emergency and along with the fireman entered the unit's engineroom to avoid being in the cab at the time of impact. The truck driver had started driving the truck about one week prior to the accident.

Probable Cause:
1. Truck was driven into path of train.
2. Failure of truck driver to vacate position on track.
3. Due to error in judgement. (Truck driver)

Other Factors:
1.

Fatalities:	Number:	Description:	Injuries:	Number:	Description:
	- 0 -			1	Employee on duty (serious)
				4	Employees on duty (minor)
				2	Passengers (minor)

Probable Cause of Casualty:
1. None
2.

Property Losses:
Railroad: $28,000
Non-Railroad: $45,000

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5. Location: Bainville, Montana
Date: 3/15/84

About 10:25 a.m., on March 15, 1984, a truckdriver operating an International Harvester truck tractor with a bottom dump hopper semitrailer departed a quarry with a load of rocks to be used at a nearby oil well site. Initially, the truck traveled on a narrow one-lane access road for about 0.6 mile, before turning onto a 1 1/2-lane-wide compacted gravel road. About 0.5 mile later, the truckdriver turned onto a two-lane gravel road leading for about 2 miles to U.S. Highway 2. The truckdriver was required to stop before turning left (eastward) onto the highway. The truck traveled on the highway, which parallels Burlington Northern railroad tracks, for about 5.6 miles before turning right (south) onto Roosevelt County Road B634E near Bainville, Montana. After turning, the truckdriver proceeded southbound 323 feet until he reached and began crossing the railroad/highway grade crossing. The grade crossing was equipped with only a standard railroad crossing warning sign. It was not equipped with flashing light signals to inform vehicle operators of an approaching train. The truckdriver had made 12 crossings on March 14 and 3 crossings prior to the accident on March 15. The truckdriver had warned fellow truckdrivers on previous trips of approaching trains at the grade crossing and cautioned them to be careful.

Amtrak passenger train No. 7, the Empire Builder, was traveling west on the single main track as the truck approached the crossing. The fireman, a qualified locomotive engineer who was operating the locomotive, said that he began sounding the standard whistle signal for a public crossing when the train reached the crossing whistlepost located about 1,067 feet east of the crossing. He also said the headlights and strobe lights were illuminated. The fireman said he first noticed the truck approaching the track when the train was about 50 feet from the crossing and immediately put the train airbrakes into emergency. The fireman and engineer said the driver appeared not to have seen or heard the train. They stated that the truck approached the crossing without stopping and proceeded onto the tracks in front of the train. They said there were no other vehicles on the road and that visibility was good.

The right side of the locomotive struck the rear 3 feet of the tractor cab, separating the tractor-semitrailer near the fifth wheel and spinning the semitrailer alongside the train. The semitrailer penetrated the baggage car and the right front of the following dormitory coach before it was spun out of the path of the train and onto its right side. The two locomotive units and baggage car derailed but remained upright, and followed a path in near alignment with the track structure. The remaining eight cars in the train separated from the lead portion and derailed in a west-southwest direction, with the rear four cars overturning onto their left sides. The train came to a stop about 1,257 feet west of the collision point. According to the event recorder on the locomotive, the train was traveling about 79 mph and had decelerated to about 67.7 mph at the time of impact. During the investigation, the radio in the truck was found in the "ON" position with the volume turned on about 110 degrees out of a possible 300 degrees turn. The pushbuttons had been bent toward the right, and the dial indicated 1600 Khz on the AM station band.

As a result of this accident, the Safety Board, in conjunction with International Harvester, conducted audibility tests with a similar Amtrak train. The Board computed the probable ambient noise level in the truck cab with the radio on to be about 86.4 decibels (dBA). Under average conditions, the minimum change likely to be detected is 1.0 dBA. The Amtrak train horn had to exceed 87.4 dBA in the cab with the window up

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and the radio on. The horn obtained the 87.4 dBA level about 100 feet before the crossing. Since the train was initially traveling at 79 mph, and decelerated to about 67.7 mph at impact, the truckdriver could have heard the train horn whistle for only about 1 second before impact if the horn was still blowing at the time of impact. The engineer may have been preparing for impact and stopped blowing the horn before the truckdriver was able to hear the horn. About 1 second before impact, the truck was about 5 feet north of the north track and was traveling about 13.5 mph. The truck could not have stopped in response to the horn. When the window was rolled down, the horn in the cab appeared to be about 9.7 dBA louder. The truckdriver could have rolled down the window and might have been able to hear the train horn when it was about 600 to 700 feet before impact. If the window was down, the train horn could have been heard 5.5 to 6.5 seconds before impact, and the truckdriver would have had about 3 seconds to perceive the train and start braking to avoid impact. If the radio was turned off and the truck was at idle, the truckdriver had an even larger opportunity to hear the train, especially if the window was open.

The truckdriver was killed. There were injuries to 39 passengers and 13 crewmembers.

The National Transportation Safety Board determined that the probable cause of the accident was the failure of the vehicle to stop at an unprotected grade crossing. A contributing factor was inaudibility due to truck cab noise.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Burlington Northern Inc. Brief of Railroad No.: DCA84XR006

Location:	Time:	Date:	Weather:	Visibility:
Bainville, Montana	1049 MST	03/15/84	Cloudy	Day/8600 FT

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Amtrak	Passenger	West	En route	1
2					

Accident Description: Westbound train No. 7 (Empire Builder) en route Seattle, WA, on BN trackage struck a southbound tractor semitrailer loaded with rock at the Roosevelt County Road Grade Crossing about 5.9 miles west of Bainville, Montana. The truck driver was killed instantly, 39 train passengers and 13 crewmembers were injured. The grade crossing had a standard railroad crossing warning sign. The whistle signal was sounded at the whistle post, located 1066.7 feet east of the crossing. The locomotive headlight and strobe light were illuminated. The truck driver had made 12 crossings on March 14th and 3 crossings prior to the accident on March 15th.

Probable Cause:
1. Failure of a vehicle to stop at unprotected grade crossing
2.

Other Factors:
1. Inaudibility due to truck cab noise

Fatalities:	Number:	Description:	Injuries:	Number:	Description:
	- 1 -	Truck driver		13	Employees on duty
				39	Passengers (includes minor injuries)

Probable Cause of Casualty:
1. Struck by train
2.

Property Losses:
Railroad: $1,504,000
Non-Railroad:

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6. Location: El Monte, California
Date: 5/4/84

About 6:49 a.m., on May 4, 1984, Amtrak train No. 1, traveling westbound on Southern Pacific Transportation Company Railroad track, struck and fatally injured the four occupants of a vehicle at the Peck Road grade crossing in El Monte, California. The accident site consists of a single main track, which extends east to west. The track alignment is tangent and the track grade is descending, with a 0.01-percent grade as it crosses Park Road.

The train, en route from New Orleans, Louisiana, to Los Angeles, California, was manned by an engineer and a fireman, who were riding in the cab of the lead locomotive. The train consisted of 2 locomotive units and 11 coaches. The engineer advised that the train was traveling at 50 mph at the time of the collision with the highway vehicle. The locomotive headlight was illuminated brightly and the train whistle was being sounded at the time of the collision. The engineer stated that he placed the train's automatic airbrake valve in an emergency stop application upon point of impact, and the train stopped approximately 1,500 feet from the point of collision.

The highway vehicle was traveling north in the middle lane of a three-lane roadway at an undetermined speed on Peck Road North when it entered the grade crossing (which intersects the roadway at a 90-degree angle) and collided with the train's lead locomotive unit. The roadway grade is ascending, with a 0.40-percent grade toward the railroad intersection.

Peck Road North is an asphalt roadway, 93 feet wide, with six marked lanes divided by a raised center median. It has a maximum authorized speed of 40 mph. Of the six marked lanes, three are used for northbound and three for southbound vehicle travel. The roadway extends north to south.

The railroad advance warning sign is legible, in good condition, and is erected 250 feet in advance of the railroad crossing. The railroad crossbuck signs, one on each side of the track, are reflectorized and are approximately 12 feet from the nearest rail. In addition, each side of the roadway is protected by flashing signal lights and double-gate arms, which measure 24 feet each and which block the entire width of the three lanes. Also, the standard "X" with the letters "RR" are painted to the right side of the roadway on each side.

The highway vehicle operator's view of westward rail traffic is partly obstructed by a paint shop building on the east side of the road, and the highway vehicle must be located approximately 80 feet from the track before the operator can look down the track to the east to observe approaching rail traffic. The automatic flashing signals, bells, and gates were operating properly at the time of the accident. An employee of the paint shop on the east side of the road stated that he heard the bells ringing and the highway vehicle strike the signal gate arm just before the collision.

A test was conducted on the flashing signals, bells, and protection gates immediately after the accident, and all were found to function properly.

The highway vehicle, a 1976 Datsun station wagon, was demolished. The train's lead locomotive unit received minor damage; none of the coaches was damaged during the collision. One of the automatic protection gate arms was broken as the result of being struck by the front end of the highway vehicle before the collision with the train.

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The Los Angeles County Coroner advised that the cause of the driver's death was head injuries due to blunt force trauma. Toxicology tests for alcohol and drugs were negative.

The National Transportation Safety Board determined that the probable cause of the accident was the failure of the vehicle operator to stop at a protected railroad/highway grade crossing due to an error in judgment.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Southern Pacific Transportation Company Brief of Railroad No.: LAX84FR003

Location:	Time:	Date:	Weather:	Visibility:
El Monte, California	0649 PDT	05/04/84	Clear	Day/3000 FT

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Amtrak	Passenger	West	En route	1
2					

Accident Description: Westbound train No. 1 struck a vehicle at the Peck Road Intersection with the railroad and fatally injured four members of the same family. The accident occurred on the Alhambra Line main track at mile post 495.30. The train speed was 50 mph. The whistle was being sounded and the headlight was illuminated at the time of the collision. The crossing is protected by flashing redlights, bells and gates. Post accident tests indicate that the protection was functioning properly.

Probable Cause:
1. Failure of vehicle operator to stop at protected rail-highway grade crossing due to error in judgment.
2.

Other Factors:
1.

Fatalities:	Number:	Description:	Injuries:	Number:	Description:
	4	Public on RR property		- 0 -	

Probable Cause of Casualty:
1. Struck by train
2.

Property Losses:
Railroad: $1,000
Non-Railroad: $4,000

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7. Location: McBee, South Carolina
Date: 7/11/84

About 7 a.m., on July 11, 1984, northbound Amtrak train No. 82, the Silver Star, struck a Rainwater Gas and Oil Company International Harvester tractor-tank semitrailer combination truck carrying 8,000 gallons of gasoline at the Cypress Street grade crossing in McBee, South Carolina. The train was operating on a track of the Seaboard System Railroad and consisted of 2 locomotive units and 14 cars. The locomotive was engulfed in fire upon impact, and the cars sustained smoke damage. The truck was consumed by fire and destroyed. The train was carrying 16 crewmembers and 309 passengers. Four passengers were treated for injuries and released, the engineer and truckdriver were killed, and the fireman received serious injuries.

Train No. 82 was operated by the Seaboard under a contractual agreement. Train No. 82 originated in Tampa, Florida, on July 10, 1984, with five cars and a single-unit locomotive. At Jacksonville, Florida, nine cars and one locomotive unit were added from train No. 92. Train No. 82 received an initial terminal brake test at Jacksonville. A crew change was made at Columbia, South Carolina, where the new crew was evaluated by a railroad supervisor. The train departed Columbia at 5:53 a.m. and made a station stop at Camden, South Carolina. The next scheduled stop was Hamlet, North Carolina.

The front portion of the train was exiting a 60-mph speed restriction when the engineer began to accelerate his train before impact. The engineer began sounding the horn in the normal manner for the Cypress Street crossing when the front of the truck pulled partially onto the crossing and stopped, apparently to get a better view to see if a train was coming. Train No. 82 struck the truck at approximately 63 mph. The truckdriver was thrown out of his tractor cab onto the side of the railbed. The cargo of gasoline spilled and ignited with an explosion. Gasoline entered a punctured hole in the nose area of the lead unit of the locomotive, causing extreme heat to enter the cab area. After impact, both the engineer and fireman jumped from the moving train approximately 425 feet north of the crossing.

On approach to the Cypress Street crossing, the view of the approaches to the crossing was blocked partially on both sides by the storage of railcars in adjacent siding track. The crossing, which was being used as a detour route, had five tracks; the main track was the centermost track. The four siding tracks contained ballast cars temporarily stored for work on the adjacent crossing which was closed for repairs.

The track was tangent at the point of impact. The track is Class 4 in conformance with the Track Safety Standards of the Federal Railroad Administration. Maximum authorized speed in the area is 79 mph.

Cypress Street is a two-lane asphalt roadway with unimproved shoulders. The road was almost level except that the approaches to the railroad crossing were inclined slightly to accommodate the elevation of the crossing. There were no pavement lines to separate the two-way traffic or to identify the edge of the pavement.

For eastbound traffic a standard 36-inch-diameter advance railroad warning sign was located along the right side of the roadway 202 feet from the westernmost rail. A standard reflectorized crossing sign was located 10 feet 6 inches west of the track centerline. A stop sign was located on the east side of the tracks, 27 feet 4 inches from the east rail. It governed movement in the intersection of Cypress and Sixth Street.

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Based on audibility testing conducted by the Safety Board, in conjunction with International Harvester, as the result of the Bainville, Montana, accident (case number 5), the Board believes that the truckdriver in the McBee accident could not hear the train horn until the train was about 100 feet away. At the train's calculated speed of 63 mph, the truckdriver would have heard the horn no more than 1.1 seconds before impact, insufficient time to avoid the collision.

The National Transportation Safety Board determined that the probable cause of the accident was that the vehicle's sight distance was restricted at the grade crossing. Contributing to the accident was inaudibility caused by truck cab noise.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

84-119

Reported by: Seaboard System RR Inc. Brief of Railroad No.: ATL-84-FR012

Location:	Time:	Date:	Weather:	Visibility:
McBee, South Carolina	0700 EDT	07-11-84	Clear	Day/100 ft.

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Amtrak	Passenger	North	En Route	1
2					
3					

Accident Description:

Tractor trailer tank truck containing gasoline stopped on grade crossing protected by railroad crossing signs and was struck by Amtrak train # 82. Engineer and truck driver were killed; fireman seriously injured; 4 passengers with minor injuries. Truck destroyed by fire. Train scorched by fire. Car on sidings and a tree obstructed view of truck driver. Speed of train was 70 mph.

Probable Cause:
1. System design inadequacy - vehicle sight distance restricted at grade crossing
2.
3.

Other Factors:
1. Inaudibility caused by truck cab noise
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
1	Engineer	1	Fireman (Serious)
1	Truckdriver	4	Passengers (Minor)

Probable Cause of Casualty:
1. Train struck gasoline truck.
2.
3.

Property Losses:
Railroad: $441,000
Non-Railroad: 100,000

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8. Location: Jacksonville, North Carolina
Date: 01/14/83

At 3:20 p.m., on January 14, 1983, an Onslow County schoolbus transporting 56 school children was struck broadside by a northbound Seaboard System Railroad freight train at a railroad/highway grade crossing protected with railroad crossing signs near Jacksonville, North Carolina. Thirty-two occupants of the schoolbus were injured, none fatally. The train did not derail, and the crewmembers were not injured. The schoolbus received substantial damage; the train's lead locomotive unit was damaged.

The schoolbus was transporting students from a public elementary school to their residences. At least five stops were made and three children were discharged before the schoolbus approached the intersection of State Route 1439 and the Seaboard main track. Eyewitness accounts indicate that the westbound schoolbus approached the track and was stopped with its front wheels slightly west of the pavement stop line. A train was approaching State Route 1439 from the south at a reported speed of 20 mph with its headlight illuminated, strobe lights flashing, and a standard crossing signal being sounded with its air-operated whistle. As the front of the lead locomotive unit was about to occupy the crossing, the schoolbus lunged forward into the path of the train. The engineer stated that, as soon as he observed the bus begin to move, he made an emergency application of the train brakes. The bus was impaled by the front coupler of the locomotive and came to rest 218 feet north of the crossing still secured to the front of the locomotive.

The accident occurred at a point 60 feet east of the intersection of State Route 1439 and U.S. Highway 17, where the single main track intersects with State Route 1439. The crossing is on a rural paved road with an asphalt surface between the rails. The angle of intersection of the highway and railroad is approximately 90 degrees, and the surface is level. The approaches to the crossing are signed and have pavement markings.

The paved road surface at the intersection was about 18 feet wide. Sight distance from the westbound approach was sufficient. Vegetation and other obstacles did not restrict reasonable observation of northbound train traffic for a westbound highway vehicle operator. The driver of a westbound schoolbus stopped at the pavement stop line would have a minimum of 200 feet of unobstructed sight distance in either direction along the railroad right-of-way.

The schoolbus driver was 17 years old. She held a valid North Carolina Class C operator license and a valid schoolbus operator license. Her driving record had no traffic violations or accidents recorded. She was a full-time high school student and was employed part-time by the Onslow County Board of Education as a schoolbus driver. She had been driving schoolbuses for approximately 1 month as a relief driver when the accident occurred.

All schoolbus drivers in Onslow County must successfully complete the driver education training program within the high school and also complete at least 40 hours of preservice training before they can apply for a schoolbus operator license. The preservice training usually consists of 2 days of classroom instruction and 3 days of behind-the-wheel instruction on the various types of schoolbuses used by the county. After obtaining a schoolbus operator license, each driver is required to complete periodic in-service training for each school year that they operate a schoolbus.

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On January 14, 1983, the schoolbus driver attended high school classes until the time she left the high school to pick up the elementary school students. She departed with 59 students and had dropped off 3 students by the time she reached the accident location.

The schoolbus driver was interviewed by the investigating police officer at the scene of the accident. She stated that she approached the grade crossing and attempted to stop the vehicle with the service brakes. However, the schoolbus continued forward into the path of the oncoming freight train. The traincrew members in the cab of the locomotive each stated that the front end of the bus was close to the east rail but would not have been struck by the train had the bus not moved forward.

Postaccident inspection of the damaged transmission suggests that the bus was in third gear at the time it was struck by the train. The gear shift pattern, clearly painted on the bus dashboard in front of the driver's position, indicated that third gear is immediately adjacent to reverse gear. It is possible that the schoolbus driver inadvertently placed the gear shift lever into third gear rather than reverse in a hurried attempt to back away from the track. Once the bus made its initial forward lunge, the driver was committed to attempt to continue across the track in an effort to avoid being struck by the train.

The National Transportation Safety Board determined that the probable cause of the accident was the busdriver's failure to stop at a grade crossing due to lack of busdriving experience.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

83-32

Reported by: Seaboard System Railroad

Brief of Railroad No.: ATL-83-FR005

Location:	Time:	Date:	Weather:	Visibility:
Jacksonville (Belgrade), North Carolina	1520 EST	01-14-83	Clear	Day/200 ft.

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Seaboard System Railroad	Local freight	North	En Route	1
2					
3					

Accident Description:

Train 1 struck side of schoolbus on grade crossing with railroad signs. Schoolbus had stopped, then lurched onto crossing in front of train. Speed of train was 20 mph. Bus driver was 17-year-old with 1 month part time bus driving experience.

Probable Cause:
1. Bus driver failed to stop at grade crossing due to lack of bus driving experience.
2.
3.

Other Factors:
1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
0		32	Public on RR property

Probable Cause of Casualty:
1. Schoolbus struck by train
2.
3.

Property Losses:
Railroad: $25
Non-Railroad: $6,000

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9. Location: Edmond, Kansas
Date: 7/20/83

At 6:38 p.m., on July 20, 1983, the second locomotive unit of an eastbound freight train was struck by a 1983 Kenworth diesel-powered tractor pulling an anhydrous ammonia tank semitrailer at a railroad/highway grade crossing of U.S. Highway 283 at MP 615, near Edmond, Kansas. The tank was ruptured in the accident. The three rear locomotive units and the five following cars of the train were derailed.

The train consist was four locomotive units, nine covered hopper cars, and one caboose. The train was operating on a single-track branch main line, without wayside signals. The train was being operated by a four-man crew, two on the lead unit No. MP 2030 and two in the caboose at the rear of the train. None of the crewmembers was injured.

The tank semitrailer was loaded to its capacity of 10,400 gallons at 265-psi pressure. The truck was northbound on U.S. Highway 282. The two truck occupants were fatally injured by acute ammonia exposure.

Highway 283 is a two-lane asphalt pavement, 22 feet wide. The highway crosses the railroad track in a north-south direction. The crossing angle is 90 degrees. Crossing protection consists of passive crossbuck signs, one on each side of the track. A standard yellow, round, State highway-type advance railroad crossing warning sign is located on U.S. Highway 283, 900 feet south of the track. A large, white railroad crossing sign is painted in the northbound lane pavement of the highway, 303 feet south of the track.

Maximum highway speed is 55 mph, maximum train speed for this branch line is 25 mph; the enginecrew of the train stated that they were moving approximately 23 mph and were sounding the engine air horn as they approached the grade crossing. This was confirmed by eyewitnesses to the accident.

Dual-tire heavy skidmarks made by the accident vehicle were found starting approximately 300 feet south of the track and extending northward for a distance of 80 feet. The truckdriver then began a right turn to the east in an attempt to avoid striking the train broadside. He was partially successful in this attempt.

The truckdriver was inattentive and did not comply with existing Federal regulations as well as with Kansas State law, both of which require vehicles transporting hazardous materials to stop before crossing railroad/highway grade crossings such as the U.S. Highway 283 crossing.

The National Transportation Safety Board determined that the probable cause of the accident was the failure of the motorist to stop at a protected grade crossing due to inattentiveness.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Missouri Pacific RR Co. Brief of Railroad No.: 4FTW83FR029

Location:	Time:	Date:	Weather:	Visibility:
Edmond, Kansas	1838 CDT	07/20/83	Clear	Day/5000 FT

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Missouri Pacific RR Co.	Local Freight	East	En Route	Branch 001
2					
3					

Accident Description:

Truck with hazardous material struck side of train 1; train 1 derailed, resulting in release of toxic agents. Speed of train 1 was 023 MPH; engineer was aware of impending accident; brakes were applied; horn was sounded.

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Probable Cause:
1. Failure of motorist to stop at protected grade crossing due to inattentiveness to duties
2.
3.

Other Factors:
1.
2.

Fatalities: Number:	Description:	Injuries: Number:	Description:
2		0	

Probable Cause of Casualty:
1. Asphyxiation
2.

Property Losses:
Railroad: $131,000
Non-Railroad: $105,000

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10. Location: Jacksonville, Florida
Date: 10/31/83

At 4:38 p.m., on October 31, 1983, Seaboard System Railroad freight train AJAMI-3 collided with a van at a railroad/private road crossing in Jacksonville, Florida. The driver of the van was injured seriously; the only passenger was killed on impact. The van was destroyed. The 3-unit locomotive and 20 following cars derailed. Fire erupted at the locomotive units, and two were destroyed. The engineer and front brakeman were taken to a local hospital, treated, and released. Damage was estimated to be $1,872,000.

Train AJAMI-3 consisted of 3 diesel-electric locomotive units and 71 loaded freight cars. The train departed the carrier's Moncrief Yard in Jacksonville at 3:07 p.m. on the day of the accident. A satisfactory initial terminal airbrake test was conducted on the train before departure. The conductor and rear brakeman were seated in the cab of the second locomotive unit while the train was en route, due to the lack of a caboose. The engineer and front brakeman were in their normal positions in the cab of the lead locomotive unit. The lead locomotive unit's headlight was illuminated brightly, and its bell and horn were being sounded for road crossings.

Numerous vehicles were leaving an industrial plant located on the south side of the track. The location of the plant relative to a city street made it necessary for the vehicles to cross the track to enter or exit the plant. Reportedly, several vehicles drove over the track as the train closely approached; the van driver started across the track too late and was struck by the front of the lead locomotive unit. The train's speed was approximately 52 mph at impact. The van was demolished.

The track crosses the private entrance road to the Timber Tech, Inc., plant. The intersection of the roadway and railroad track is approximately 90 degrees. The track is tangent for several miles north of the involved road crossing. There is a 0.72-percent descending track grade for southbound trains approaching the road into the plant. The company had erected a sign to warn drivers of high-speed trains. The crossing was equipped with passive railroad crossing signs.

The van driver held a valid Florida chauffeur license that was restricted to the use of corrective lenses. His driver record showed three offenses for the past 7 years: improper lane change, operating a motor vehicle with improper tag/restriction certificate, and no inspection sticker.

The available sight distance at the railroad/private road crossing was practically unlimited from a vehicle approaching the track from the south. Meteorological conditions also did not interfere with the view of the train. It is possible that the sound of the locomotive horn might not have been heard by the van driver as he approached the intersection of the private road and the track. The van driver exercised poor judgment when he attempted to drive his vehicle across the track ahead of the oncoming train.

The National Transportation Safety Board determined that the probable cause of the accident was that the van driver drove across the grade crossing in front of a train.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Seaboard System Railroad

Brief of Railroad No.: ATL-84-FR001

Location:	Time:	Date:	Weather:	Visibility:
Jacksonville, Florida	1638 EST	10-31-83	Cloudy	Day/9,000 ft

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Seaboard System Railroad	Freight	South	En Route	1
2					
3					

Accident Description:

Van drove past large advance warning sign onto track at grade crossing with railroad crossing signs. Train 1 struck van, resulting in derailment, fire, fatality and injury. Speed of train was 52 mph. Two locomotive units destroyed by fire.

Probable Cause:
1. Van driver drove across grade crossing in front of train.
2.
3.

Other Factors:
1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
1	Public on RR property (Van passenger)	1	Public on RR property (Van driver)

Probable Cause of Casualty:
1. Van struck by train
2.
3.

Property Losses:
Railroad: $1,871,000
Non-Railroad: 1,000

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11. Location: Shelly, Idaho
Date: 1/27/84

About 6:50 p.m., on January 27, 1984, a Union Pacific Railroad Company (UP) train, Extra 121 East (Goshen local), was moving southbound on the main track toward Shelly, Idaho. At the Clinger Road crossing the train struck a westbound GMC suburban vehicle with 11 occupants. The Clinger Road grade crossing is located 1.4 miles north of Shelley at MP 177.35. Four of the vehicle passengers were injured fatally. Six passengers and the motor vehicle operator were injured.

The investigation disclosed that the 1978 four-door vehicle was being operated westward toward the UP main track that was protected by a standard crossbuck warning sign. The head brakeman was sitting on the left side (east side) of the locomotive operating cab as the train approached the crossing. The long end of the locomotive was leading, and the engineer was operating the controls on the right side (west side) of the cab. The right front of the locomotive struck the right middle section of the vehicle and pushed the car into the borrow pit on the west side of the main track and south of Clinger Road. Nine of the 11 riders were ejected from the vehicle.

The weather conditions at the time of the accident were cloudy with calm winds and a temperature of 25° F. It was dark and the crossing was not lighted. According to the Idaho Highway Patrol, the road surface was covered with ice and snow.

The head brakeman said that he saw the vehicle approaching from the east and assumed that the vehicle operator saw the train. When the train was about five car lengths and the car was about three vehicle lengths from the crossing, he sensed that the vehicle was not going to stop and yelled to the engineer, "We're going to hit him." The engineer placed the train in emergency before the unit struck the car. The engineer was sounding the whistle, starting at the whistle sign, and he was still sounding it when the vehicle was hit. The train's headlight was on bright.

The driver of the vehicle stated that he passes over the crossing as many as 10 times a day. He said that on the night of January 27, 1984, there was noise and confusion inside the car and he was distracted. He said that he did not hear the locomotive whistle and never saw the train. He had seen trains previously at the crossing. He was moving the vehicle very slowly over the crossing, preparing to stop at the stop sign at State Highway 91.

Clinger Road is a two-lane, east-west, asphalt-paved county road that terminates at State Highway 91. The roadway is level and curves slightly to the right for westbound traffic approaching the crossing and ascends slightly just before reaching the wooden planked crossing. There were no obstructions at Clinger Road that would limit a driver's vision, and only the driver's inattention prevented him from safely operating his vehicle over the grade crossing.

The National Transportation Safety Board determined that the probable cause of the accident was the failure of the motor vehicle operator to stop at a grade crossing due to distraction from van passengers.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

84-49

Reported by: Union Pacific Railroad

Brief of Railroad No.: DEN-84-FR015

Location:	Time:	Date:	Weather:	Visibility:
Shelley, Idaho	1850 MST	01-27-84	Cloudy	Dark/250 feet

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Union Pacific Railroad	Local Freight	East	En route	1
2					
3					

Accident Description:

Van drove onto track in front of train at grade crossing with railroad crossing signs. Speed of train was 57 mph. Engineer aware of impending accident. Van driver lives 600 feet from grade crossing and crossed it frequently. Driver had 10 passengers and was distracted by noise in van.

Probable Cause:
1. Failure of motor vehicle operator to stop at grade crossing due to distraction from
2. van passengers.
3.

Other Factors:
1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
4	Public on RR Property (van passengers)	7	Public on RR Property (Van driver and passengers)

Probable Cause of Casualty:
1. Train struck truck
2.
3.

Property Losses:
Railroad: -0-
Non-Railroad: $6,000

-41-

411

12. Location: Malakoff, Texas
Date: 3/30/84

About 11:20 a.m., on March 30, 1984, a St. Louis Southwestern Railroad Company freight train struck an empty tractor-semitrailer traveling over a grade crossing in Malakoff, Texas. Westbound train No. 02MBSMF-29 struck the tractor at about the fifth wheel on the passenger side of the northbound truck. On impact the tractor and trailer separated. The trailer came to rest on the south side of the track, and the tractor came to rest on the north side of the track.

The train consisted of 4 diesel locomotive units, 64 loaded cars, 10 empty cars, and a caboose. The train's speed was approximately 28 mph. The impact caused the 4 locomotive units and 24 trailing cars to derail. The first three locomotive units remained upright and rolled clear of the wreckage. The fourth locomotive unit overturned and was buried in the wreckage of the trailing cars. About 10 minutes after the derailment, fire erupted and spread through the wreckage.

Most of the derailed cars were piggyback flatcars loaded with truck trailers. The fire involved one trailer carrying chromic acid, a toxic and corrosive solid, which warranted an evacuation of about 300 people in a 1/2-mile radius from the accident site. The evacuation lasted for about 6 hours.

The truckdriver was employed by Texas Clay Industries, located about 2 blocks southwest of the accident site. He had worked for the company for only 1 week. At the time of the accident, the truckdriver had just unloaded his truck and was returning to the quarry for another load. As the truckdriver left the clay plant property, he made a 90-degree left turn onto a 22-foot-wide, oil-surfaced residential street. The street is tangent for 370 feet to the grade crossing. A passive advance railroad crossing warning sign is located 231 feet from the crossing. Houses on the east side of the street obstructed the driver's visibility as he moved northward toward the crossing. At a point 95 feet from the crossing, he had partial visibility of the approaching train. At a point 70 feet from the crossing, he had full visibility of the train. Witnesses reported that they heard tires screeching and looked around to see the truck slide to a stop on the crossing at the moment of impact.

The train was being operated by a qualified locomotive engineer. The engineer and head brakeman stated that the truck did not come into view until seconds before impact. The train's headlight was on, and the whistle was being sounded. After an emergency brake application was made, both crewmembers lay on the floor. There were no train crewmember injuries.

The National Transportation Safety Board determined that the probable cause of the accident was that the truckdriver saw the train too late and drove onto the tracks in front of the train.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: St. Louis Southwestern Railway Company Brief of Railroad No.: FTW-84-FR025

Location:	Time:	Date:	Weather:	Visibility:
Malakoff, Texas	1120 CST	03-30-84	Clear	Day/3,000 feet

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	St. Louis Southwestern Railway Company	Freight	West	Enroute	1
2					
3					

Accident Description:

Tractor trailer dump truck drove onto grade crossing with railroad crossing signs and was struck by train, resulting in derailment of 3 locomotives and 24 cars; fire; fatality; release of hazardous materials; evacuation of over 300 persons.

Probable Cause: 1. Truck driver saw train too late and drove onto tracks in front of train
2.
3.

Other Factors: 1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
1	Public on RR Property (Truck driver)	0	

Probable Cause of Casualty:
1. Train struck truck
2.
3.

Property Losses:
Railroad: $4,700,000
Non-Railroad: 30,000

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13. Location: Carrsville, Virginia 1/
Date: 4/12/84

At 2:30 p.m., on April 12, 1984, Chesapeake and Ohio Railway Company (C&O) train FPOR-12 departed Portsmouth, Virginia, for Richmond, Virginia, with 3 locomotives units, 108 cars (26 loaded, 82 empty), and a caboose. The trailing gross tonnage of the 6,685-foot-long train was 5,232 tons. There were no exceptions to the predeparture brake test.

About 3:20 p.m., a 1980 Isle of Wight County schoolbus carrying 31 students ranging in age from 5 to 14 years was traveling south on the two-lane gravel roadway of State Route (SR) 615 toward a single-track grade crossing of the Seaboard System Railroad near Carrsville, Virginia. According to the students in the schoolbus, the busdriver discharged two students in front of their home at a private driveway on the north side of the crossing, drove across the crossing, discharged another two students opposite a side road called Duke's Lane, drove south about 900 feet, and discharged a fifth student at a private driveway. She then shifted the schoolbus into reverse gear and backed the schoolbus about 900 feet northbound on SR 615 and into Duke's Lane, turned right from Duke's Lane onto northbound SR 615, and drove onto the crossing where she stopped the schoolbus with the steering axle between the rails. The weather was clear and the afternoon sun was to the busdriver's left. There were crossbucks on both sides of the crossing.

While the busdriver performed these maneuvers, the freight train was approaching the crossing from the east. The three crewmembers in the lead locomotive unit stated that when the train was about 1 to 1 1/2 miles east of the crossing, they observed a cloud of dust at the crossing. The traincrew stated that when the train was about 1/2 mile east of the crossing, the schoolbus was stopped and facing south on SR 615 about 200 feet south of the tracks, and that it then backed into a dirt road (Duke's Lane) which ran parallel to the track. The engineer who was operating the train reported that he began to sound the whistle and bell as a precaution when the lead unit of the train was about 1/10 mile east of the whistle board. The whistle board was located 1,563 feet east of the center of the crossing. He continued to sound the whistle and bell as the traincrew observed the schoolbus turn right from Duke's Lane onto northbound SR 615, drive onto the crossing, and stop with the steering axle between the rails. The fireman reported that the side door of the schoolbus was closed when the schoolbus pulled onto the tracks. When the train was about 500 feet east of the crossing and the schoolbus was stopped on the tracks, the engineer stated that he placed the locomotive brake valve of the 49-mph train into emergency braking. About 3:25 p.m., and before the brakes could stop the train, the lead locomotive struck the right side of the schoolbus in front of the right-side door. The train traveled an estimated 1,980 feet west of the crossing before it stopped. It did not derail.

The schoolbus body and the steering axle separated from the chassis at impact. The bus body rotated 180° counterclockwise, rolled over 270° to the right, and came to rest on its left side about 80 feet southwest of the crossing. The chassis, with the engine still mounted to it, came to rest upside down between the schoolbus body and the crossing. A fire started in the engine area after the chassis came to rest. The steering axle of the schoolbus came to rest west of the schoolbus body.

1/ For more information, read Highway Accident Report--"Collision of Isle of Wight County, Virginia, Schoolbus with Chesapeake and Ohio Railway Company Freight Train, State Route 615, near Carrsville, Virginia, April 12, 1984" (NTSB-HAR-85/02).

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Several passengers stated that the engine was running while the schoolbus was stopped on the track and that the busdriver was grinding the gears as she attempted to shift the schoolbus into reverse. One passenger reported that the busdriver was trying to start the engine, a second reported that the busdriver had both of her hands on the steering wheel after she restarted the engine, and a third reported that the busdriver was just sitting there and was not trying to back the schoolbus. Several of the students reported that the busdriver said "be quiet, I got to concentrate," "be calm," and "I can't make it" just before the collision.

Several passengers reported that they saw and/or heard the approaching train when the schoolbus was backing on SR 615 and as the schoolbus was being driven forward onto the track from its turnaround point on Duke's Lane. Local residents north and south of the crossing reported that they heard the train whistle before the collision.

Of the 26 school-aged schoolbus passengers, 2 were injured seriously, 1 had moderate injuries, and the other 23 sustained minor injuries. The busdriver was seriously injured and died 5 days after the accident; none of the schoolbus occupants was ejected. The traincrew was not injured.

The 44-year-old busdriver had driven schoolbuses for 8 years and had a valid Virginia license with an "S" endorsement which permitted the operation of schoolbuses with no restrictions. She had no traffic violations on her record other than a conviction for driving an unregistered vehicle; this violation occurred before she became a schoolbus driver. Most of the busdriver's friends, her husband, and work associates reported that the driver was experiencing difficulty in keeping order among the elementary school-aged children on her route. The school principal reported that the busdriver had come to him at least once a week with disciplinary problems, and that in some cases, the busdriver had gone directly to the parents of some of the children on her route. Several passengers on the busdriver's route reported that she stopped the schoolbus almost daily to discipline the children.

The 1983-1984 annual contract between the busdriver and the Isle of Wight County School Board required that the busdriver: stop at railroad grade crossings in compliance with Section 46.1-245 of the Code of Virginia, open the side entrance door and determine when it was safe to cross the railroad tracks, keep the side entrance door closed when the schoolbus was in motion, and attend annual training where railroad grade crossing procedures were reviewed in detail. The busdriver involved in the accident attended annual training in August 1983.

There is no route available that would avoid either this crossing or another railroad crossing farther south on SR 615. The only alternative would be to let the students out of the schoolbus and have them walk across the tracks to their homes. Eight children on the schoolbus at the time of the accident stated that the busdriver did not stop before driving over one or both of the two grade crossings on the accident route; 5 stated that the busdriver did stop at the grade crossing; 10 either did not remember or did not respond to questions concerning whether the busdriver did or did not stop; and 3 other children were not interviewed. Several persons reported that they had observed schoolbuses failing to stop at the accident crossing, both before and after the accident. Based on an interview with a former busdriver on the accident route, the Safety Board believes that the busdriver was aware that trains were likely to be encountered at this crossing.

The busdriver first could have seen the train to her left 1,800 feet east of the crossing, or about 25 seconds before the collision, as she backed northward on SR 615. There was only one period during that 25 seconds when the train was not visible to the

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busdriver when, because of the 2.3-percent downgrade to the east on Duke's Lane, the rear portion of the schoolbus roof obscured the train as the busdriver completed her backing maneuver about 40 feet into Duke's Lane. However, as soon as the busdriver started to pull forward for the right turn, the approaching train was visible again. Tests indicated that it took 9 seconds to pull from the stopped position on Duke's Lane onto the track. During the time the schoolbus was pulling forward onto the track, the train could be observed at any time by a person seated at the controls of the schoolbus, either by looking through the window on the right side directly behind the side door, through the glass panels in the door when the door was closed, through the door opening when the door was opened, or through the right corner of the windshield.

The National Transportation Safety Board determines that the probable cause of the accident was the schoolbus driver's failure to stop before driving onto the railroad crossing to determine that it was safe to proceed.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: News Media

Highway
Brief of ~~Accident~~ No.: DCA-84-AH-008

Location:	Time:	Date:	Weather:	Visibility:
State Route 613, Carrsville, Virginia	3:25 p.m.	April 12, 1984	Clear	Clear

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Chesapeake and Ohio Railroad	Freight	Westbound	En Route	001
2	(Operating on Seaboard System Right-Of-Way)				
3					

Accident Description: Train struck schoolbus at grade crossing. Minimal damage to lead engine of train. Schoolbus suffered extensive damage. Traincrew in lead engine aware of impending collision, having seen the schoolbus pull onto the crossing and stop. This is a "passive" grade crossing in a rural area protected by advance warning signs and crossbucks at the crossing.

Probable Cause:
1. The National Transportation Safety Board determines that the probable cause of the accident was the
2. schoolbus driver's failure to stop before driving onto the railroad crossing to determine that it was
3. safe to proceed.

Other Factors:
1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
1	Schoolbus driver	26	Schoolbus passengers, ages 5 to
			14, minor to serious injuries.

Probable Cause of Casualty:
1. Train struck schoolbus
2.
3.

Property Losses:
Railroad: ? (Minor)
Non-Railroad: $27,000 (Schoolbus)

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14. Location: Haskell Heights, Indiana
Date: 4/20/84

About 4:25 a.m., on April 20, 1984, a Grand Trunk Western freight train departed Chicago, Illinois, for Battle Creek, Michigan, with an engineer, fireman, and head brakeman in the lead locomotive, and a conductor and rear brakeman in the caboose. Additional cars were picked up in Harvey, Illinois.

About 7:41 a.m., the eastbound train, with 26 loaded cars, 51 empty cars, 2 locomotive units, and 1 caboose, entered the south track of a three-track railroad/highway grade crossing at U.S. Route 421 near Haskell Heights, Indiana. The train was traveling about 40 mph. Witnesses stated that the overhead crossing signals were activated, that the crossing gates were lowered, and that the weather was foggy, with witness estimates of visibility varying between 100 and 900 feet. Two tractor-semitrailers were stopped north of the crossing in the southbound lane of the north-south, two-lane, 55-mph highway. The driver of the second truck stated that he activated his four-way flashers when he stopped for the crossing. A van, a pickup truck, and an automobile were stopped south of the crossing.

About 7:42 a.m., a southbound 78,000-pound tractor-cargo tank semitrailer, operated by Franger Gas Company, Inc. (Franger) and transporting 9,124 gallons of propane, swerved around the trucks stopped in the southbound lane, entered the northbound lane, passed the two stopped trucks on the left, and reentered the southbound lane. The truck crashed through the lowered crossing gate, continued southbound onto the crossing while turning to the right, and collided with the 54th car in the 77-car train at about 50-55 mph. The force of the collision derailed the 52nd through 62nd railroad cars and tore open the truck's propane cargo tank. Nine of the 11 derailed cars were empty. The lumber and scrap paper cargoes in the two loaded cars that derailed caught fire and were destroyed.

Propane vapor from the ruptured cargo tank ignited, engulfed the railroad crossing and five vehicles at the crossing in a 500-foot-diameter fireball, and propelled the cargo tank 720 feet to the east and parallel to the train. The cargo tank came to rest parallel to and between the center track and the north track at the three-track crossing. A portion of the left-front corner of the cargo tank shell and forward head was torn from the cargo tank and was found beside a garage about 300 feet south of the crossing. The truck tractor did not strike the train as it separated from the semitrailer and came to rest about 52 feet north of the railroad right-of-way in a field west of the highway. The tractor and semitrailer were destroyed in the fire.

The driver of the propane truck died in the accident. Two of eight occupants in vehicles at the crossing were burned critically and later died; a third person was burned seriously; a fourth person sustained moderate burns; and four persons received minor burns. A local resident standing in his yard about 300 feet south of the crossing also sustained minor burns. The five crewmembers of the train were not injured.

The 50-year-old propane truckdriver held a valid Indiana operator license, was a full-time police sergeant and a part-time truckdriver, was physically qualified to operate commercial vehicles in interstate commerce, and had no traffic violations on his driving record. His record showed one reported accident.

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The truckdriver's wife reported that on the day before the accident, the truckdriver awoke about 6:15 a.m., went to work at the police department, returned home in Elkhart, Indiana, between 4 p.m. and 4:30 p.m., and baby-sat his grandchild at home until about 8 p.m. He visited his sister at her home until about 11 p.m., returned to his home, and went to bed about midnight. The truckdriver's wife reported that the truckdriver's alarm clock was set to ring at either 4 a.m. or 5 a.m. on the morning of the accident, but that she could not recall the actual time he awoke. The truckdriver drove to the Franger terminal in Elkhart, picked up the tractor-cargo tank semitrailer, and departed for a propane loading facility about 100 miles away in Whiting, Indiana. A shipping document from the propane loading facility indicated that the truckdriver began loading propane at 6:12 a.m., and that he completed the loading operation at 6:40 a.m. According to representatives at the loading facility, the completion time shown on the shipping document is the time that loading was completed, not necessarily the time that the truckdriver actually left the facility.

The 1981 conventional cab, three-axle Kenworth tractor was leased by Franger from Gelco Leasing, Inc. The 1957 two-axle, steel, MC-330 Fruehauf cargo tank semitrailer was owned by Franger. It had a 250-psig working pressure and a 10,610-gallon water capacity. Both the tractor and semitrailer were equipped with air-mechanical service brakes and 7-inch-wide brake linings. The pushrod travel on the tractor brakes indicated that the brakes were adjusted properly. The brakes on the semitrailer front axle were worn down to the rivets that secured the lining material to the braking pads. All four of the semitrailer brakes made only partial contact with the brake drums.

U.S. Route 421 is straight for at least 1 mile north of the crossing and is level at the accident site. An advance railroad crossbuck pavement marking and an advance warning sign are located about 782 feet north of the nearest rail for southbound vehicles approaching the crossing. Stop lines are painted on the highway lanes 15 feet from the nearest rail on either side of the crossing. There were no tire skidmarks attributable to the Franger truck in the crossing area. Tire yaw marks began on the east side of the northbound lane about 80 feet north of the nearest rail and curved to the right into the southbound lane and onto the crossing.

The degree to which the visibility was decreased by fog at the railroad crossing at the time of the accident could not be determined. Under clear conditions, the visibility at the accident site is virtually unlimited. The drivers of five vehicles, including the drivers of two tractor-semitrailers, had reacted to the overhead and side flashing lights at the crossing and had stopped within minutes before the accident. The driver of the second tractor-semitrailer north of the crossing (the first vehicle in the path of the propane truck) stated that his four-way flashers were activated. Also, the accident truckdriver would have received some advance warning that the crossing was ahead in spite of the fog when he drove over the railroad crossbuck pavement marking about 782 feet north of the crossing. Based on the statements of the witnesses, the Safety Board believes that the visibility at the time of the accident was reduced to between 100 and 900 feet, and that an alert driver should have been able to see at least as well as the other drivers stopped at the crossing.

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The National Transportation Safety Board determined that the probable cause of the accident was the truckdriver's inattention, which resulted in his failure to see the stopped vehicles and the train ahead at the railroad/highway grade crossing until it was too late to stop his vehicle. 1/

1/ JIM BURNETT, Chairman, filed the following concurring statement:

I agree with my colleagues that the Haskell Heights accident was caused by the truckdriver's inattention. But I believe that the summary report as adopted clearly establishes lack of sleep as a cause for his inattention, and should be included in the probable cause for the following reasons:

> The truckdriver's wife reported that on the day before the accident, the truckdriver awoke about 6:15 a.m., went to work at the police department, returned home in Elkhart between 4 p.m and 4:30 p.m., and baby-sat his grandchild at home until about 8 p.m. He visited his sister at her home until about 11 p.m., returned to his home, and went to bed about midnight. The truckdriver's wife reported that the truckdriver's alarm clock was set to ring at either 4 a.m or 5 a.m., on the morning of the accident, but that she could not recall the actual time he awoke. The truckdriver drove to the Franger terminal in Elkhart, picked up the tractor-cargo tank semitrailer, and departed for a propane loading facility about 100 miles away in Whiting, Indiana. A shipping document from the propane loading facility indicated that the truckdriver began loading propane at 6:12 a.m., and that he completed the loading operation at 6:40 a.m.
>
> The truckdriver could have driven the 100 miles from the Franger terminal to the propane loading facility in about 2 hours. If he began loading his truck at 6:12 a.m. as indicated by the shipping document, then he must have left his home around 4 a.m. on the morning of the accident. Since the truckdriver did not go to bed until midnight, he obtained only 4 hours rest in the 25 1/2 hours from 6:15 a.m. on the day before the accident until 7:42 a.m. on the day of the accident.

Therefore, I believe that the probable cause should be:

> The National Transportation Safety Board determines that the probable cause of the accident was the truckdriver's inattention due to lack of sleep, which resulted in his failure to see the stopped vehicles and the train ahead at the railroad/highway grade crossing until it was too late to stop his vehicle.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: News Media — Highway Brief of Accident No.: DCA-84-AH-009

Location:	Time:	Date:	Weather:	Visibility:
U.S. 421 Grade Crossing Haskell Heights, Indiana	7:42 a.m.	April 20, 1984	Overcast	Patches of fog/ 100 to 300 yds.

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Grand Trunk Western Railroad	Freight	Eastbound	En Route	001
2					
3					

Accident Description:

Two tractor-semitrailers stopped for flashing lights and lowered gates at crossing while train was crossing Highway 421. Tractor-semitrailer combination loaded with propane (flammable gas) approached crossing at high speed, trued left into opposing lane of Highway 421, passed the two parked trucks, and was turning toward the right when it collided with the train. The cargo tank semitrailer ruptured, releasing the propane which ignited in a 900-foot fireball. Truck driver was ejected and suffered fatal head trauma and thermal burns. occupants of other vehicles waiting at the crossing suffered thermal burns. Several cars derailed.

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Probable Cause: 1. The National Transportation Safety Board determines that the probable cause of this accident was the truckdriver's inattention, which resulted in his failure to see the stopped vehicles and the train ahead at the railroad/highway grade crossing until it was too late to stop his vehicle.

Other Factors: 1.

2.

Fatalities:	Number:	Description:	Injuries:	Number:	Description:
	3	Truck driver, 2 occupants of other vehicles at scene.		7	4 minor, 1 serious, 1 moderate; thermal burns — occupants of other motor vehicles at scene. 1 minor thermal burn local resident.

Probable Cause of Casualty:

1. Burns
2. Inhalation of fumes

Property Losses:

Railroad: Unknown

Non-Railroad: $60,000 (Tractor, semitr.

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15. Location: Lacon, Illinois
Date: 4/23/84

At 7:05 p.m., on April 23, 1984, Atchison, Topeka and Sante Fe Railroad Company (ATSF) freight train No. 263 WI, with 10 locomotive units, 60 loaded cars, and 45 empty cars, was proceeding at 42 mph through a grade crossing on State Route 26 in Lacon, Illinois, when it was struck in the side by a truck, causing the derailment of 18 cars.

Train No. 263 WI departed Streator, Illinois, for Kansas City, Missouri, at 1800 CST, April 23, 1984, with 10 diesel units, 60 loaded cars, 56 empty cars, and 5,080 tons. The train was occupying the crossing when it was struck at the 36th car by a straight-body truck. The truck traveling south on State Route 26 avoided the crossing gates and turned right (west) at the last moment and struck flatcar TTCX 976075 in the train. The truck was carrying a log-lifting machine which dislodged and went over the cab of the truck and struck container MOLU 2055292 on the flatcar.

Railcar TTCX 975101 with container YSAA 208086 carrying a Poison B was also involved in the derailment. The flatcar was derailed but did not turn over or dislodge container YSAA 208086. A hazardous material report by Illinois State Police indicated no damage or spill.

An advance warning sign was located approximately 606 feet north of the crossing and was visible and in good condition. A train occupying the crossing could be seen in clear weather 1,800 feet north of the tracks on State Route 26. The roadway was paved with asphalt and was in good condition. All lane markings and road edgelines were in good condition.

In the derailment area the ATSF maintains two main tracks with a maximum speed restriction of 70 mph. Train 263 WI was under a 45-mph speed restriction due to tonnage exceeding 5,000. Train traffic is controlled by a Centralized Traffic Control (CTC) System with train dispatchers located at Ft. Madison, Iowa.

The weather at the time of the accident, according to police and witnesses, was dark with misting-type precipitation, and the temperature was 45° F.

The truckdriver was familiar with the route and previously had made five or six roundtrips, hauling logs. At the time of the accident the truckdriver had been at work for more than 9 hours. As a result of this collision, the truckdriver was fatally injured. Toxicological tests were performed on the truckdriver, and the results were negative for alcohol and drugs. There were no injuries to the train crewmembers.

The National Transportation Safety Board determined that the probable cause of the accident was the failure of the driver to stop at a grade crossing due to a willful act of the driver.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Atchison, Topeka & Santa Fe Railway Brief of Railroad No.: CHI-84-FR##1

Location:	Time:	Date:	Weather:	Visibility:
Lacon, Illinois	1905 CST	04-23-84	Rain	Dark/300 feet

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Atchison, Topeka & Santa Fee Railway	Freight	West	En Route	1
2					
3					

Accident Description:

Truck carrying heavy equipment drove onto crossing grade crossing and struck side of train, resulting in derailment and fatality. Truck driver drove pass flashing light signals and around crossing gates. 18 cars derailed. Speed of train was 40 mph.

Probable Cause:
1. Failure of driver to stop at grade crossing due to willful act of driver.
2.
3.

Other Factors:
1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
1	Truck driver	0	

Probable Cause of Casualty:
1. Truck struck train
2.
3.

Property Losses:
Railroad: $138,000
Non-Railroad: 50,000

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16. Location: Avondale, Colorado
Date: 5/17/84

At 9:22 a.m., on May 17, 1984, Missouri Pacific Railroad Company eastbound freight train PK-17, while traveling on the Atchison, Topeka and Santa Fe Railway Company (ATSF) main track at MP 606.65, collided with an anhydrous ammonia-laden semitrailer at the Chico Road grade crossing near Avondale, Colorado. The engineer and fireman were injured fatally, and the head brakeman and the truckdriver suffered minor injuries. Approximately 24 other persons suffered minor injuries from inhalation of anhydrous ammonia in assisting in the rescue efforts and being in the vicinity of the accident. The cargo tank and its lading were destroyed. The lead locomotive unit and the truck-tractor were damaged heavily. The fireman was operating the train at the time of the accident, and the head brakeman was riding in the second unit of the train. The train was traveling at 57 mph, and the highway vehicle was moving between 3 and 4 mph. There was a fire and explosion due to the collision and impact.

Train PK-17 departed at 3:40 a.m. from Pueblo, Colorado, en route to Horace, Kansas, with 4 locomotives, 12 loaded cars, 32 empty cars, and a caboose. As the eastbound train departed the trainyard from Pueblo, the conductor had radio communications with the head-end crew, and the radio functioned properly.

There were no stops or unusual occurrences between Pueblo and the accident site. The rear-end crew of train PK-17 stated that the first knowledge they had of any indication of any trouble was when the train's airbrake system went into an emergency application. They immediately radioed the head-end crewmembers to determine why the train had gone into an emergency application, and they received no response. A second attempt was made to contact the head-end crew members with negative results. The rear-end crew then radioed the operator of the station at Avondale and requested emergency assistance.

The engineer was removed, unconscious, from the lead locomotive unit and transported by ambulance to a hospital in Pueblo, where he died 15 hours later. The fireman who was operating the train at the time of the collision was assisted into an ambulance and taken to a hospital. He died 9 days later. The head brakeman who had been riding in the second locomotive was found in a nearby field on the north side of the main track. He stated that he remembers jumping off the train just before its stopping after the collision and must have passed out as he was running away from the train. The truckdriver and several of the rescue team members, including members from the rural fire department, the Colorado State Police, the Sheriff's Department, train crewmembers from the trains at Avondale, and a survey group party near the accident site were all transported to medical centers for emergency treatment. All were treated and released.

The tractor-semitrailer tank truck with about 7,200 gallons of anhydrous ammonia was moving north on the Chico Road crossing at low speed, when the front of the lead locomotive unit struck the vehicle. There were no automatic signals or gates, and the crossing was indicated by the standard reflectorized crossbuck sign, located on the southwest quadrant of the crossing. The train was not derailed; the tractor was swung around and came to rest on its wheels, upright, on the northeast quadrant of the crossing. The tank trailer was shoved onto the hood of the locomotive unit and was swung around with great force, allowing the rear of the tank to strike the middle of the lead locomotive unit on the south side. The force of the tank striking the south side of the locomotive unit

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displaced the main generator and engine of the locomotive unit from its original position. The tank came to rest on its side on the southeast quadrant of the crossing. The tank was punctured, and most of its contents were spilled.

The train brakes were applied when the air pipes broke in the collision, and the train stopped approximately 1,643 feet east of the point of impact.

Approaching the crossing, an eastbound train moves on tangent track, and the grade is level. The single main track is elevated about 3 to 4 feet above the surrounding terrain. An average of 12 trains are operated daily over this line, including several carriers using the joint trackage. Train operations over this section of joint track are governed by the ATSF and controlled by the dispatcher at La Junta, Colorado. A standard whistle sign (W) is located 1,320 feet in advance of the crossing, on the engineer's side (south side) of the main track.

The 30-year-old truckdriver was examined by a physician on October 10, 1983, in accordance with 49 CFR 391.41 and 391.49. A nonsmoker, he was found to be in excellent health with good vision and hearing and no known abnormality or pathology which could have affected his reaction time, coordination, perception, or decisionmaking. Based on an analysis of blood extracted from the driver 4 hours after the accident, no evidence was found to indicate that he was under the influence of alcohol or drugs at the time of the accident. There is no record that he had ever been convicted of driving under the influence of, or while intoxicated by, alcohol or drugs in Texas and 15 surrounding States.

Audibility tests conducted the day after the accident by the Colorado State Patrol using a calibrated Quest Model 215 sound level meter indicated that the ambient noise volume inside the truck cab was 83-95 dBA, with an average of 87.5 dBA. This was obtained with the radio in the "ON" position and at the same volume level found immediately after the accident. Tests of the train whistle intensity indicate that it did not exceed the cab's level of sound until just before impact.

The truck cab was found with the right window fully closed and the left window on the driver's side open about 1/4 inch. The air conditioner in the cab was turned off at the time of the accident.

The accident site provided few limitations to the field of vision of the truckdriver. At the time of the accident, the sun was in the east.

The National Transportation Safety Board determined that the probable cause of the accident was the truckdriver's failure to stop at a grade crossing as required by Federal regulations (49 CFR 392.10).

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Atchison Topeka and Santa Fe Railway Co Brief of Railroad No.: DCA-84-AZ009

Location:	Time:	Date:	Weather:	Visibility:
Avondale, Colorado	0915 MDT	05-17-84	Clear	Day/6,000 ft.

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Missouri Pacific Railroad Co	Freight	East	En Route	1
2					
3					

Accident Description:

Tractor trailor tank truck containing 7,200 gallons of anhydrous ammonia drove onto grade crossing protected by standard crossing signs and was struck by train, resulting in fire, explosion, release of hazardous materials, fatalities and injuries. Train did not derail. Train speed was 51 mph

Probable Cause:
1. Truckdriver failed to stop at grade crossing as required by Federal regulations(49 CFR 392.10)
2.
3.

Other Factors:
1. Inaudibility caused by truck cab noise.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
2	Traincrew	1	Traincrew
		23	Others including emergency response personnel, truckdriver, and public

Probable Cause of Casualty:
1. Burns
2. Inhalation of fumes
3.

Property Losses:
Railroad: $332,000
Non-Railroad: in excess of $50,000

17. Location: Williams, California
Date: 7/02/84

About 5:15 p.m., on July 2, 1984, a Colusa County Sheriff's Department patrol car was struck by a Southern Pacific Railroad Company (SP) road switcher, consisting of 2 locomotive units, at the Meyers Road grade crossing about 4 miles southeast of Williams, California. The road switcher, train No. 3408, was traveling south at about 40 mph when it struck the patrol car, which had braked to stop but skidded onto the crossing. The deputy sheriff was killed in the collision. The train did not derail, nor were there any injuries to the train crewmembers.

To the east of the railroad tracks and to the north of Meyers Road is a large complex of buildings. The southernmost building sits about 30 feet north of the north edge of Meyers Road and is about 90 feet east of the railroad crossing. The view to the north for southbound train traffic is hampered by these buildings. For some distance the view is completely cut off when a vehicle is about 1/4 mile from the crossing, due to the proximity and extent of the buildings. Clear vision to the north for oncoming train traffic is not encountered until a vehicle is about 125 to 130 feet from the crossing. For westbound traffic on Meyers Road, there is a yellow advance railroad crossing sign about 636 feet east of the crossing and white-painted railroad crossing signs.

On the day of the accident, the deputy sheriff had been on patrol. He was headed west on Meyers Road and apparently was braking and skidding when his car was struck by the southbound locomotive unit at the right front of the car. The car came to rest in the dry ditch immediately adjacent to and east of the railroad tracks approximately 185 feet from the south edge of Meyers Road.

The westbound train, Extra SP-3408, also known as the Woodland Switcher, was en route from Williams to Woodland, California. The scheduled route of the road switcher after its initial departure from Woodland was to perform switching between Williams and Woodland. The road switcher had performed some switching at Williams and was on its return trip to Woodland when the accident occurred. The train was manned by an engineer, a conductor, and a brakeman, who were riding in the cab of the lead locomotive unit, and by another brakeman, who was riding in the cab of the trailing locomotive unit.

The traincrew's view of westbound highway traffic approaching the railroad track was limited by a building in the northeast quadrant of the intersection to approximately the last 100 feet of vehicle travel. The engineer placed the train's automatic airbrake valve in emergency application, and the train stopped about 1,940 feet south of the crossing. At the point of collision the track is tangent and the grade is level. The roadway in the area is a conventional two-lane highway known as Meyers Road and crosses the Southern Railroad tracks. The grade of the roadway approaching the accident site is westbound, and the alignment is almost tangent. The roadway surface is asphalt-concrete. The railroad crossing was of the same material as the roadway surface and was in fair condition with the exception of the area next to the rails. The asphalt next to the rails had small pieces broken out and patches where repairs had been made.

The railroad advance warning sign was legible and in good condition. It was erected approximately 544 feet in advance of the crossing. The railroad crossbuck signs, one on each side of the track, were the standard reflectorized signs, were in good condition, and were located to the right of the roadway, approximately 10 feet from the nearest rail. The crossing was not equipped with automatic warning devices.

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The automobile was a 1983 Chevrolet Malibu four-door sedan and was completely outfitted and equipped as a police patrol vehicle. The vehicle was destroyed.

The California Highway Patrol, Williams area, requested that the Valley Division Multidisciplinary Accident Investigation Team (MAIT) be assigned to this accident. The team requested and performed a complete mechanical inspection of the vehicle to determine if any mechanical conditions or defects contributed to the cause of the collision. The vehicle appeared to have been in a satisfactory operating condition before the collision, and no mechanical defects were discovered.

The examination and test performed of the train airbrake system and the sand deposited at the crossing at the time the emergency brakes were applied indicated that the brakes of both locomotive units were functioning properly. The interviews of the crewmembers and other witnesses revealed that the whistle was being sounded and the headlight and mars light were illuminated brightly. The speed recorder on the locomotive did not have speed recorder tape. The MAIT calculated that the speed of the train at the time of the collision was approximately 46.3 mph and that the speed of the automobile was no more than 5 to 10 mph.

The average daily traffic on Meyers Road just east of the railroad was approximately 596 vehicles. The train volume over the railroad crossing at Meyers Road was 6 per day. The opinions and conclusions of the MAIT did not identify any California Vehicle Code or other code violations as a result of the collision.

The view of an approaching train would be partly blocked by the buildings on the north side of Meyers Road until a vehicle was near the grade crossing. However, this probably was not a factor in this accident because an eyewitness in a pickup truck on the other side of the grade crossing stated that the officer had not looked to his right while approaching the site. He apparently was completely unaware of the train until the last second. The MAIT officers also concluded that the vehicle driver was inattentive. The witness observed the driver look to his left and straight ahead, but not to the right where the train was.

The National Transportation Safety Board determined that the probable cause of the accident was that the vehicle driver saw the train too late and skidded onto the crossing into the path of the train due to inattentiveness.

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84-113

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Southern Pacific Transportation Company Brief of Railroad No.: LAX-84-FR[illegible]8

Location:	Time:	Date:	Weather:	Visibility:
Williams, California	1715 PDT	07-02-84	Clear	Day/Unknown

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Southern Pacific Transportation Company	Locomotive	West	En Route	1
2					
3					

Accident Description:
Automobile skidded onto grade crossing with railroad crossing signs and into path of light locomotive, resulting in fatality of driver. Driver of automobile was Colusa County deputy sheriff. Speed of train was 40 mph.

Probable Cause:
1. Vehicle driver saw train too late and skidded onto crossing in path of train
2.
3.

Other Factors:
1.
2.
3.

Fatalities: Number:	Description:	Injuries: Number:	Description:
1	Public on RR property (driver of automobile)	0	

Probable Cause of Casualty:
1. Train struck vehicle
2.
3.

Property Losses:
Railroad: $1,000
Non-Railroad: 8,000

59

-59-

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18. Location: Port St. Lucie, Florida
Date: September 27, 1984

At 6:20 a.m., on September 27, 1984, a schoolbus driver and her student son boarded a schoolbus owned and operated by the Indian River Academy at the private school in Fort Pierce, Florida, to began picking up students along her prescribed morning route. The busdriver had made a routine pretrip inspection of the schoolbus, which did not include examining or unlocking the rear emergency door, which was fitted with a deadbolt lock in addition to the normal latch.

About 6:50 a.m., as it proceeded westbound on two-lane Walton Road in Port St. Lucie, Florida, the schoolbus approached a single Florida East Coast Railway Company (FEC) track at grade. It was dawn and cloudy, and the roadway was wet. The crossing was equipped with active warning devices--a bell, flashing lights, and automatic gates; however, there was no stop line painted on the pavement. The busdriver stopped the schoolbus short of the track, opened the front door of the schoolbus and looked in both directions. The schoolbus stop arm was extended and its attendant lights were flashing. The busdriver said she saw a train, the first she had ever encountered at this crossing, approaching from her left. According to the busdriver and students, the crossing warning devices were not activated and they did not hear the locomotive whistle when the schoolbus first was stopped at the crossing.

Northbound FEC freight train Extra 412 North was approaching the crossing at a reported speed of 38 mph with its lead locomotive unit headlight illuminated. The engineer was operating the locomotive unit from the right side. The conductor was seated on the left side opposite the engineer. The engineer said he began sounding the standard whistle signal at the Riverview grade crossing, 2,688 feet south of Walton Road. According to the engineer, the schoolbus was in his view at that moment, and the warning devices at the crossing were activated. The whistle post was located 2,620 feet south of the crossing at Walton Road.

The busdriver believed that the front of the schoolbus was too close to the track and attempted to shift the manual transmission into reverse gear in order to back. One student said that he believed the busdriver got the transmission into gear and stalled the engine. Another student said that the schoolbus "lurched" forward toward the track. According to the busdriver, the engine stalled and the schoolbus rolled forward. The parking brake was not applied.

The train conductor stated that he saw the schoolbus move forward and appear to veer around the automatic gate arm as it descended. He said also that he was reaching for the emergency brake valve on his side of the locomotive cab when the engineer made an emergency application of the train brakes. After placing the automatic brake valve handle in the emergency position, the engineer immediately released the locomotive brake. Sand from the locomotive sanders was found on the track 628 feet from the center of the crossing. Placement of the automatic brake valve handle in the emergency position provides automatic power cutoff and instantaneous sanding.

After unsuccessful efforts to restart the engine, while the schoolbus was astride the track, the busdriver stood up and ordered the passengers off the schoolbus. Two passengers, a 13-year-old boy and a 15-year-old girl seated in the two front seats, were "pushed" by the busdriver out the front door. The two fleeing passengers ran away from the schoolbus. A third passenger, a 12-year-old girl seated in the second seat behind the

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busdriver, ran to the rear of the schoolbus to awaken the busdriver's 10-year-old son who was asleep on a seat. From behind the schoolbus a pickup truck driver saw the two children at the rear emergency door for an estimated 10 to 15 seconds, while they appeared to be attempting to open it. The busdriver was still on the schoolbus calling to the two children to get off, and one of them turned and ran toward the front of the schoolbus.

The train struck the left side of the schoolbus approximately 8 feet rearward of the front bumper. The force of the collision separated the schoolbus body from the chassis. Both the body and chassis were rotated clockwise, the right side of the schoolbus body striking the warning device structure. The rear of the schoolbus body and left-rear corner of the chassis were struck by the right side of the locomotive in secondary collisions before they came to rest in the northeast quadrant of the intersection. At rest, the schoolbus body lay across the chassis. The body was located 47 feet north of the roadway and 5 1/2 feet east of the track. The chassis was located some 36 feet north of the roadway and 2 feet east of the track. Both components were damaged substantially. The three remaining schoolbus occupants were ejected; the busdriver was injured seriously, and the two students were killed. There was no fire.

The front of the train came to rest 798 feet north of the center of the crossing. The cars of the train remained coupled and in line on the track. The traincrew was not injured.

A deadbolt lock had been installed on the emergency door of the schoolbus with a key located outside and a handle inside. Postcrash examination revealed that it was locked at the time of the collision. From inside the schoolbus, the lock handle could be reached only by a person in a seated or crouched position near the rear door. The lock handle could be seen only when sitting in the right-rear seat or when standing facing the rear door and looking directly down at the lock handle. There was no placard explaining the location or operation of the lock.

The National Transportation Safety Board determined that the probable cause of the accident was the inadequate standards for certifying nonpublic schoolbus drivers, insufficient training and testing programs, and the limited experience of the schoolbus driver, which led to the intrusion of the schoolbus onto the railroad track when the driver misshifted the transmission. Contributing to the accident was the absence of a stop line on the westbound approach to the grade crossing. Contributing to the severity of the accident was the engineer's delay in applying the train brakes and the locked deadbolt on the rear emergency door of the schoolbus.

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NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20594

Reported by: Florida East Coast Railway Company Brief of Railroad No.: ATL-84-MR031

Location:	Time:	Date:	Weather:	Visibility:
Port St. Lucie, Florida	0655 e.d.t.	09/27/84	Cloudy	Dawn/visibility no obscured

Train:	Railroad:	Class:	Direction:	Operating Phase:	Track No.:
1	Florida East Coast Railway Company	Freight	North	En route	001
2					
3					

Accident Description:

Train struck schoolbus at crossing. The schoolbus was destroyed. The train's reported speed was 38 mph. The engineer was aware of the impending accident.

Probable Cause: 1. The National Transportation Safety Board determines that the probable cause of this accident was the inadequate standards for certifying nonpublic schoolbus drivers, insufficient training and testing programs, and the limited experience of the schoolbus drivers, which led to the intrusion of the schoolbus onto the railroad track when the driver misshifted the transmission. Contributing to the accident was the absence of a stop line on the westbound approach to the grade crossing. Contributing to the severity of the accident was the engineer's delay in applying the train brakes and ~~the locked deadbolt on the rear emergency door of the schoolbus.~~

Fatalities: Number:	Description:	Injuries: Number:	Description:
2	Schoolbus passengers	1	Schoolbus driver (serious)

Probable Cause of Casualty:

1. Schoolbus struck by train
2.

Property Losses:

Railroad: $5,300

Non-Railroad: $3,000

62

APPENDIX B

NATIONAL TRANSPORTATION SAFETY BOARD RECOMMENDATIONS CONCERNING OPERATION LIFESAVER

The following Safety Recommendations were issued as a result of the Safety Board's Railroad/Highway Accident Report--"Collision of a Chicago, Rock Island and Pacific Railroad Company Freight Train with an Automobile, Des Moines, Iowa, July 1, 1976" (NTSB-RHR-77-2):

--to the National Safety Council:

H-77-25

Serve as a national focal point and coordinator for the total development, implementation, and evaluation of a nationwide "Operation Lifesaver" railroad/highway grade crossing program. This program should be undertaken with the full support and cooperation of all interested groups and agencies, especially the Association of American Railroads, the International Association of Chiefs of Police, the National Highway Traffic Safety Administration, the Federal Highway Administration, the Federal Railroad Administration, and the States.

--to the Association of American Railroads:

H-77-26

Provide support [to] and cooperate with the National Safety Council in its efforts to develop and implement a nationwide "Operation Lifesaver" railroad/highway grade crossing safety program by encouraging its members to allocate additional railroad resources for this effort.

--to the National Highway Traffic Safety Administration:

H-77-27

Seek additional resources and actively participate [with] and support the National Safety Council in the development, implementation, and evaluation of a nationwide "Operation Lifesaver" railroad/highway grade crossing safety program.

--to the Federal Highway Administration:

H-77-28

Actively participate with and support the National Safety Council in the development, implementation, and evaluation of a nationwide "Operation Lifesaver" railroad/highway grade crossing safety program.

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--to the Federal Railroad Administration:

H-77-29

Actively participate with and support the National Safety Council in the development, implementation, and evaluation of a nationwide "Operation Lifesaver" railroad/highway grade crossing safety program.

--to the International Association of Chiefs of Police:

H-77-30

Provide support [to] and cooperate with the National Safety Council in its efforts to develop and implement a nationwide "Operation Lifesaver" railroad/highway grade crossing safety program by encouraging its members to allocate additional police resources for this effort.

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APPENDIX C

STATES WITH OPERATION LIFESAVER PROGRAMS

State	Kickoff Date
Alabama	July 1976
Alaska	June 1979
Arizona	March 1979
Arkansas	April 1981
California	April 1979
Colorado	August 1977
Connecticut	December 1982
Florida	October 1974
Georgia	December 1974
Idaho	June 1972
Illinois	August 1976
Indiana	March 1980
Iowa	September 1980
Kansas	November 1974
Kentucky	September 1977
Louisiana	November 1981
Maine	October 1982
Maryland	June 1984
Massachusetts	December 1982
Michigan	April 1980
Minnesota	May 1982
Mississippi	May 1975
Missouri	October 1977
Montana	September 1983
Nebraska	August 1973
Nevada	May 1985
New Hampshire	September 1983
New Jersey	June 1984
New Mexico	July 1979
New York	July 1982
North Carolina	April 1979
North Dakota	May 1982
Ohio	September 1978
Oklahoma	December 1979
Oregon	October 1977
Rhode Island	December 1982
South Carolina	August 1978
South Dakota	September 1983
Tennessee	October 1979
Texas	May 1977
Utah	February 1976
Vermont	October 1984
Virginia	September 1980
Washington	November 1983
West Virginia	October 1980
Wisconsin	May 1985
Wyoming	May 1985

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